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8 JUN 1990
C.F.T.R.I., MYSORE

35th
YEAR OF
PUBLICATION

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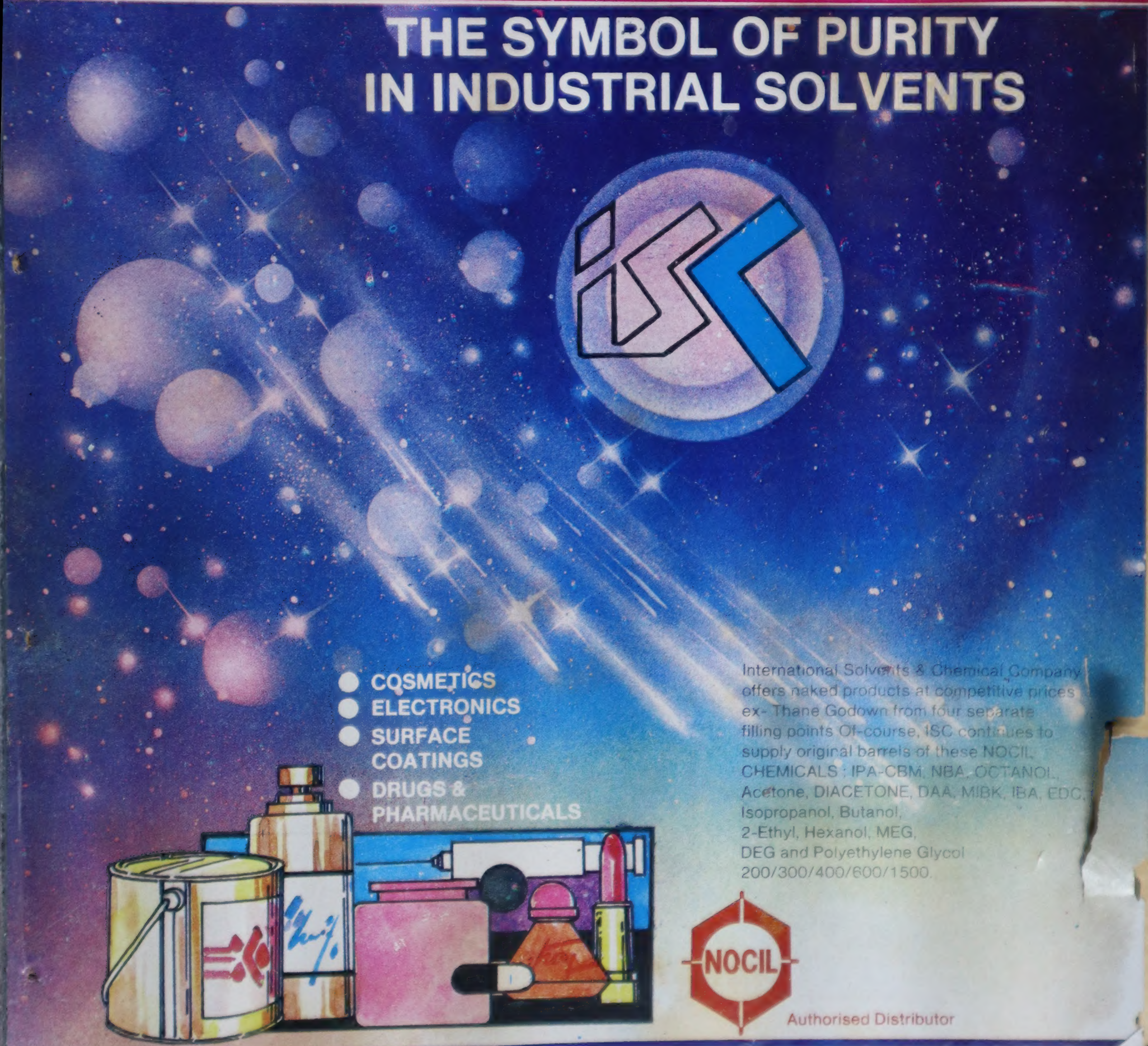

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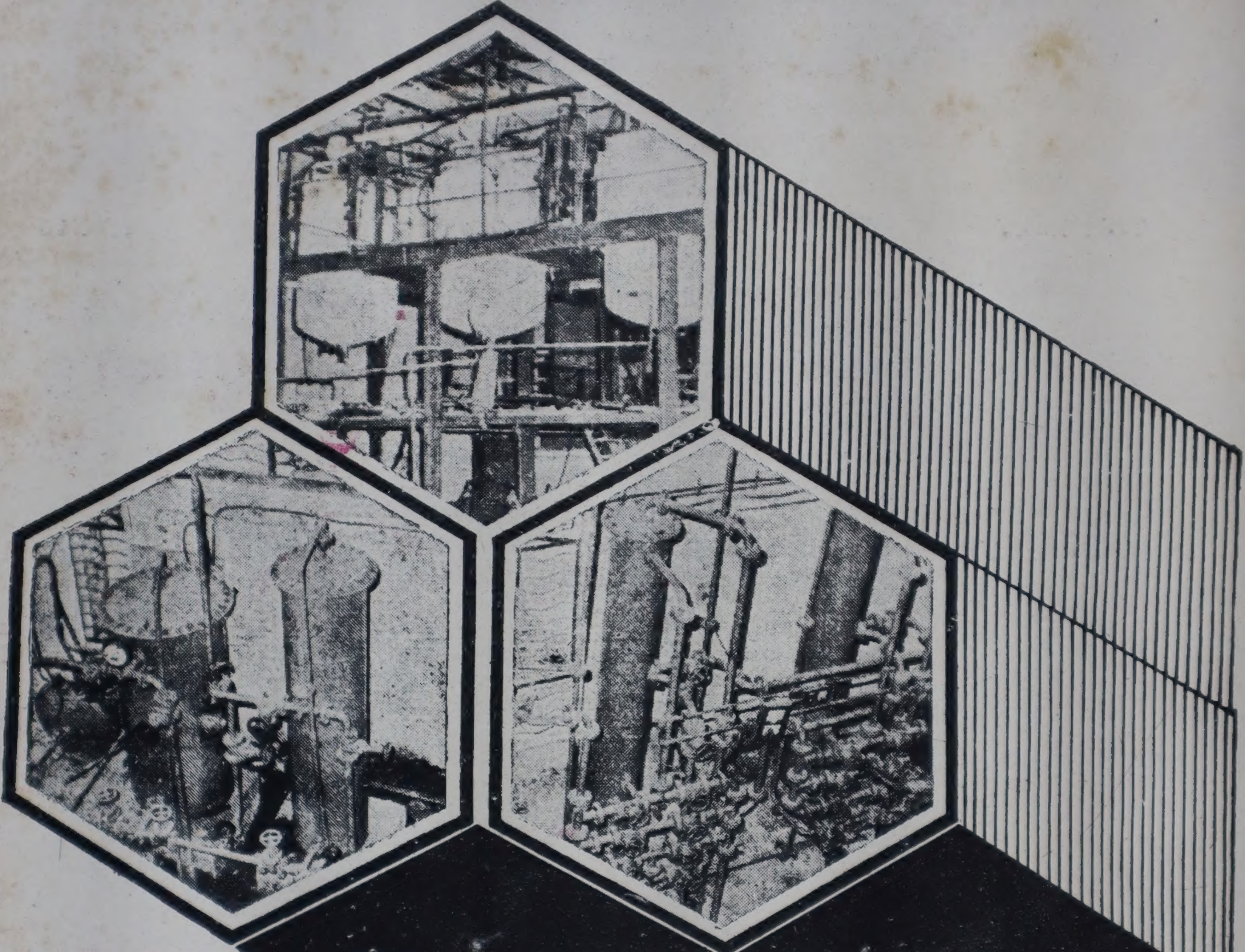

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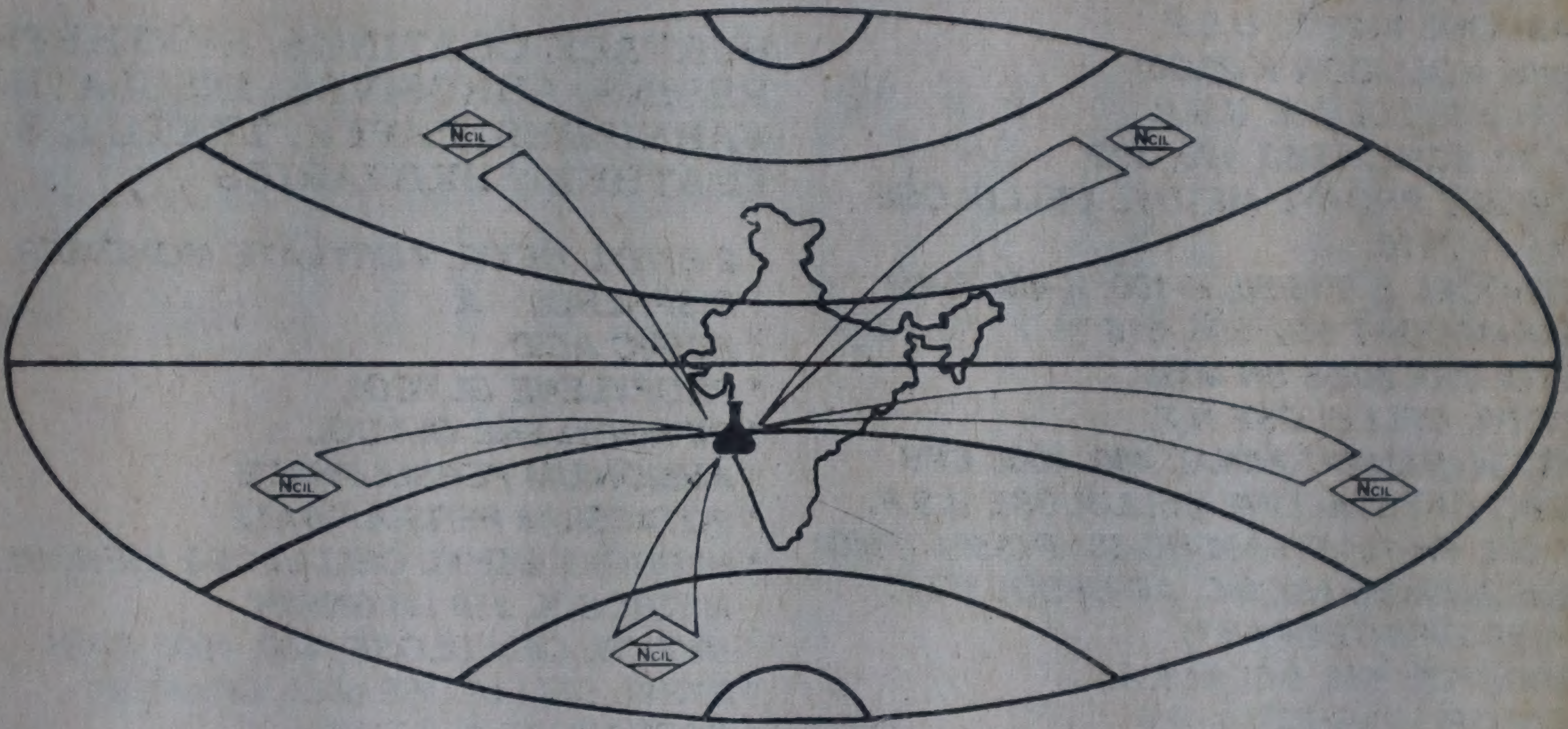

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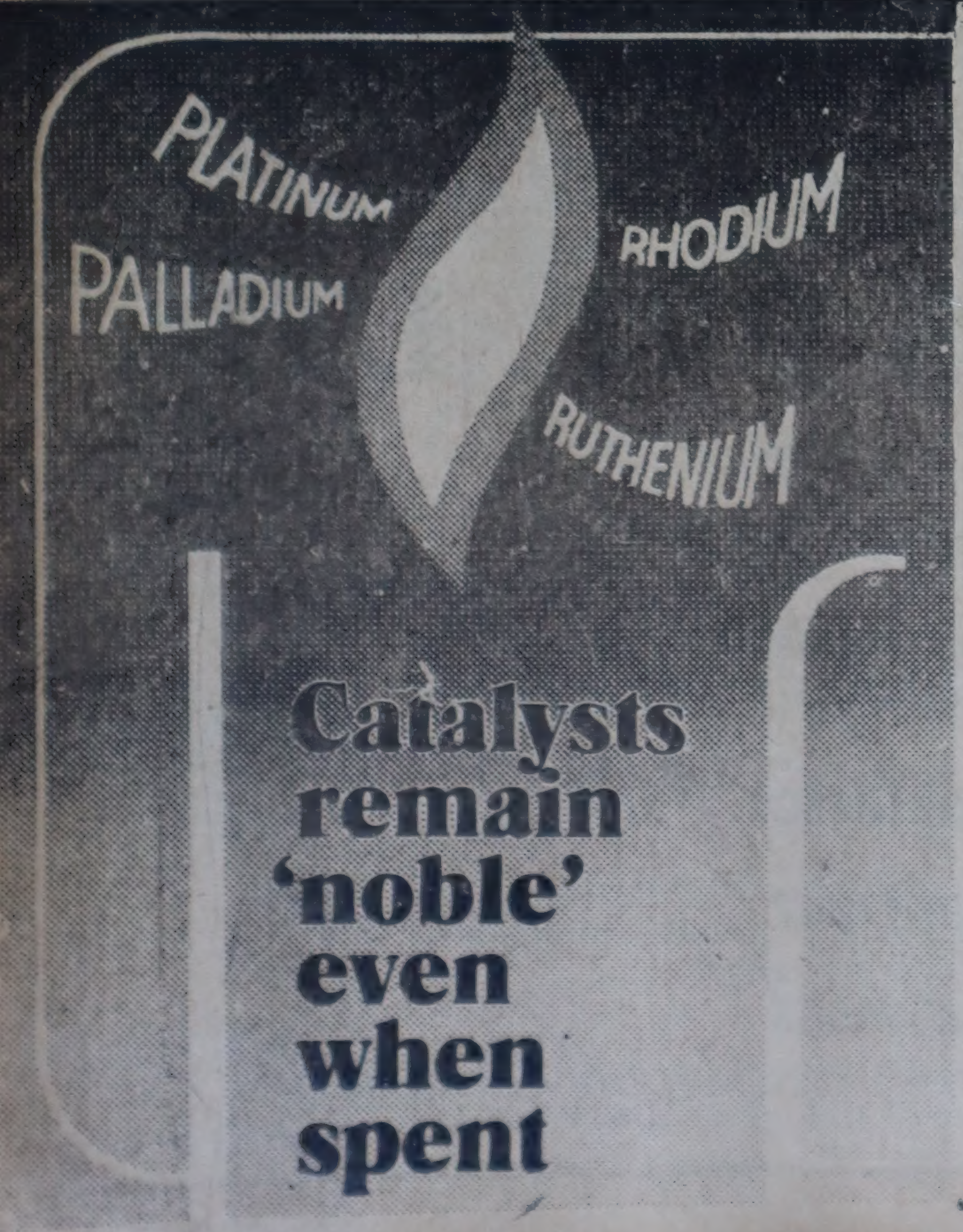

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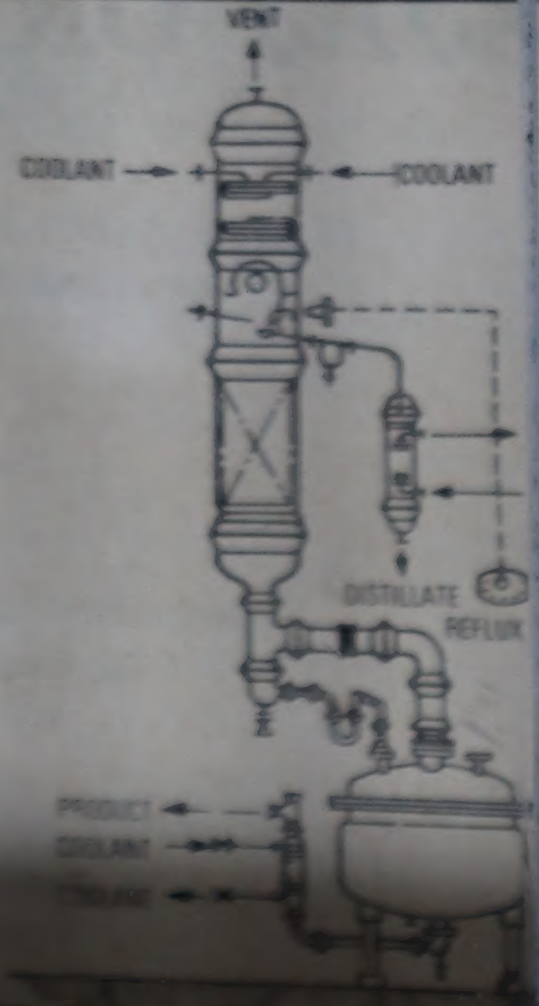

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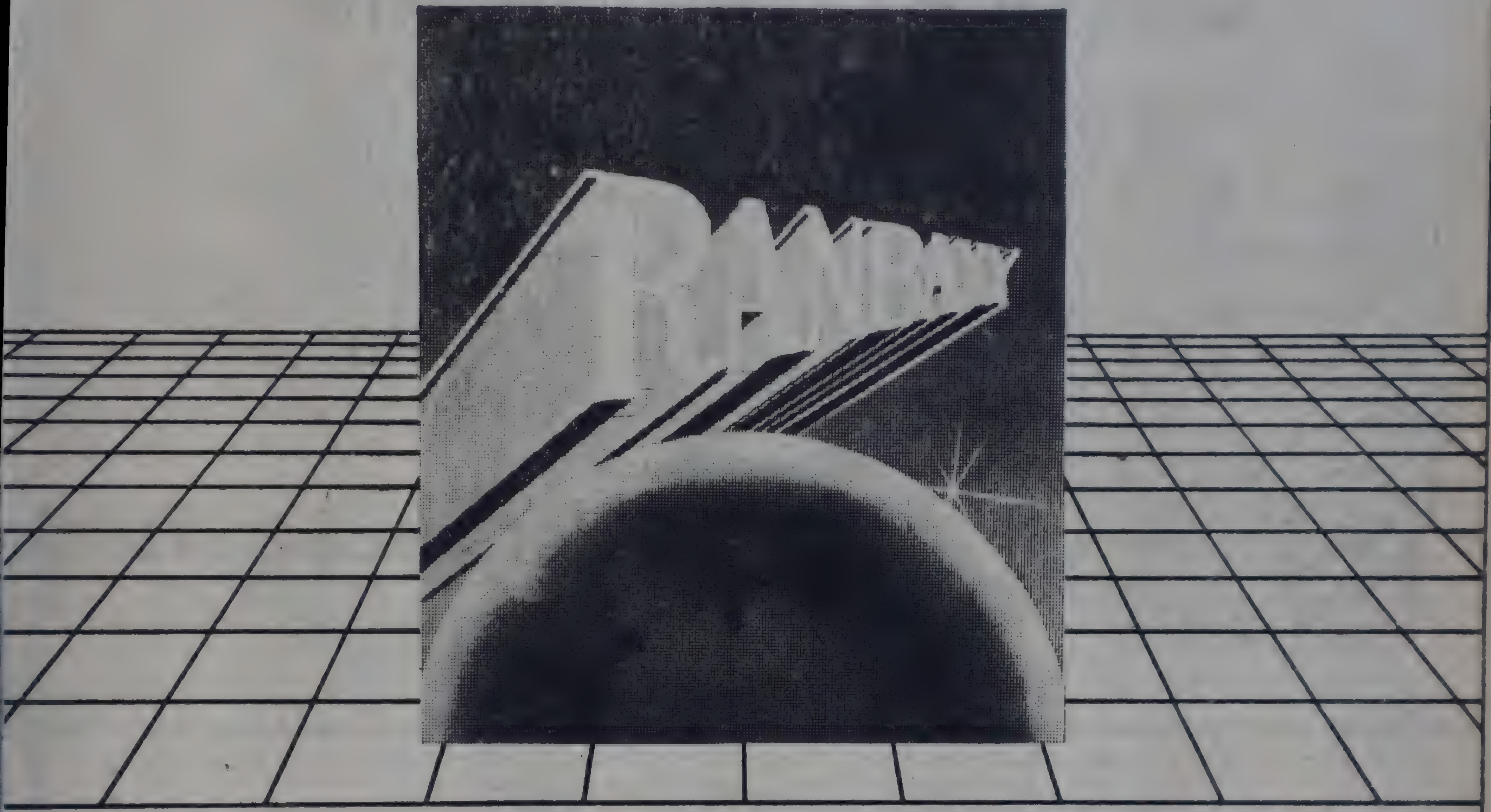

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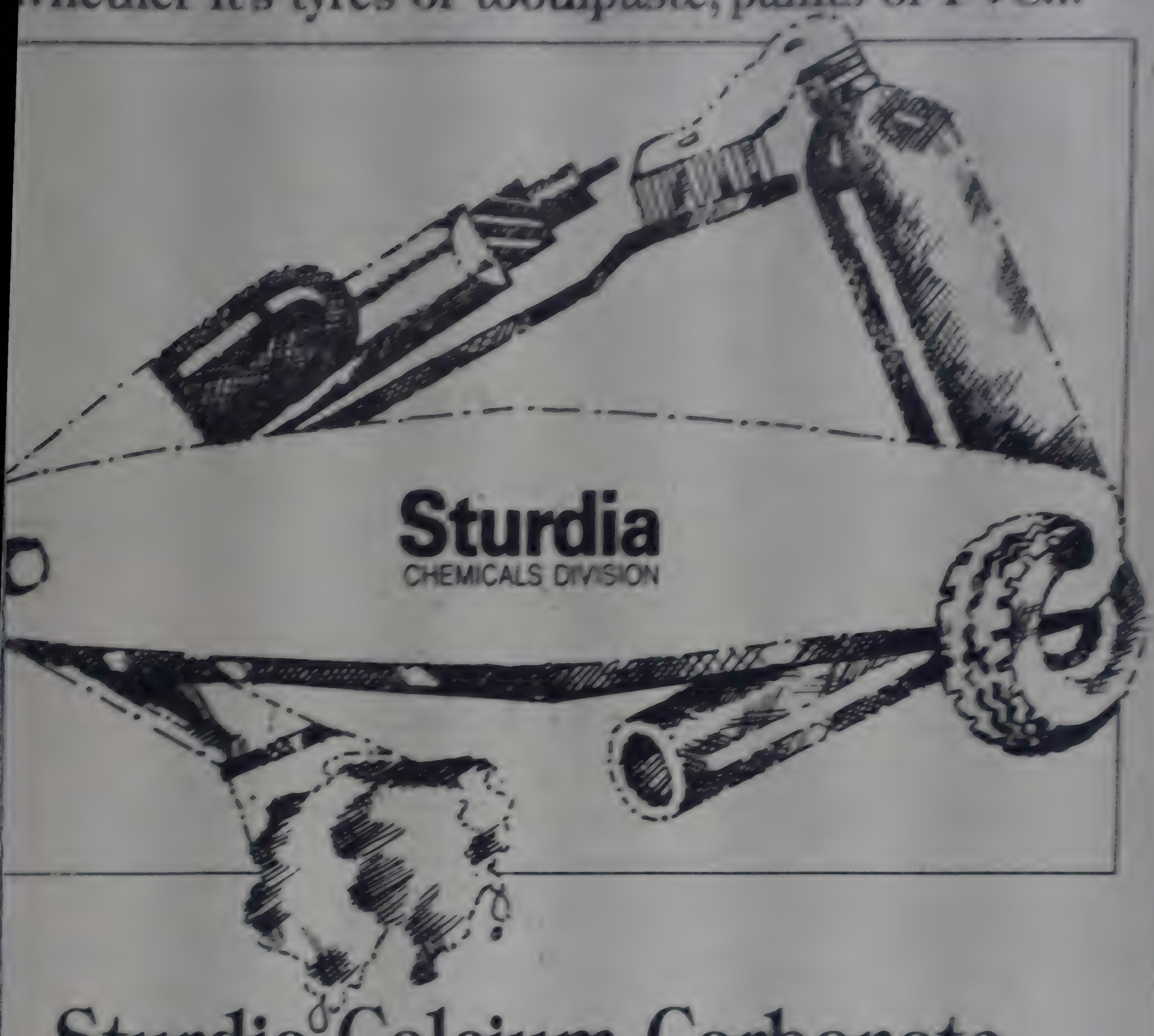

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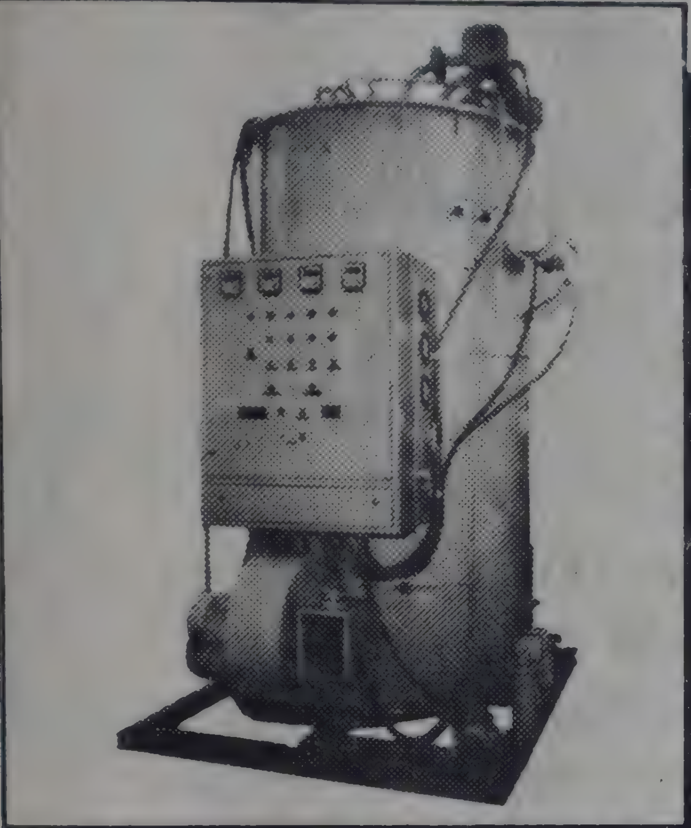

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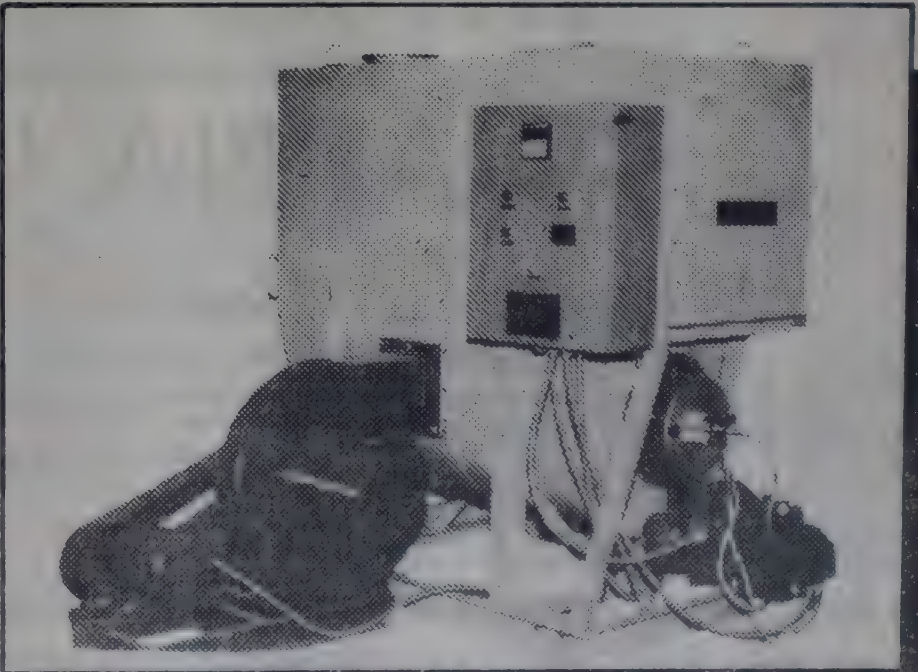

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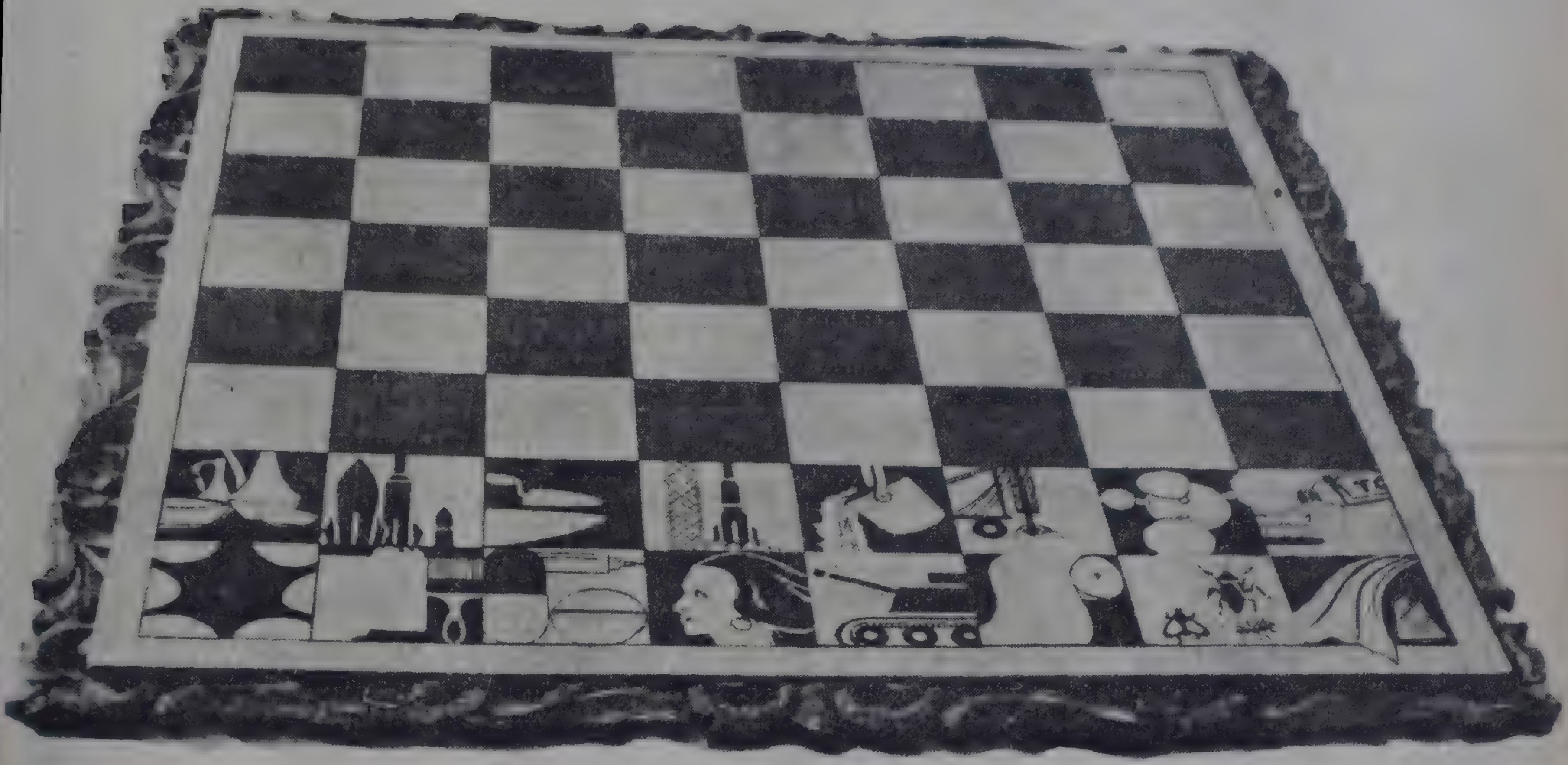

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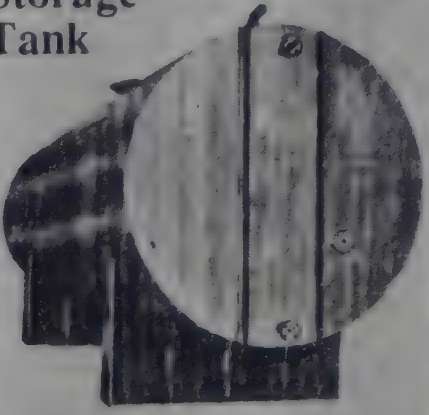

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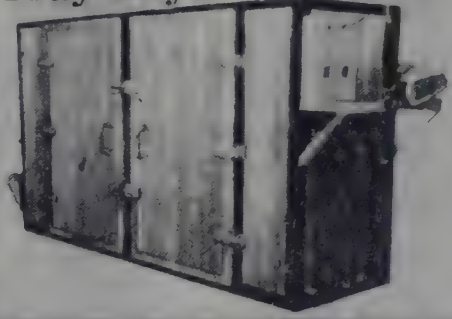

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CHEMICAL
WEEKLY

VOL. XXXV DECEMBER 26, 1989 NO. 16

HERALDING THE 21st CENTURY - 33

need to reaffirm faith in the destiny of man

mental scientists are blazing new, bold, and imaginative o discover the interactions that bind the elements of land, biota, and energy into planet Earth. Understanding these s is imperative if future generations are to inherit a habet, because human activity has expanded and developed t where anthropogenic environmental changes are jeopontinued human existence. Science stands at the threshold ecedented opportunity to study and learn the far-reaching ns of both anthropogenic and natural environmental

rehensive study of the global environment entitled "Misnet Earth" was set forth in the USA two years ago based lowing five central considerations:

volution under way in the sciences is leading to the treathe physical, biological, chemical, and geographical parts bal system as an integrated and responsive whole.

tific understanding of each part and the interactions among approaching a stage at which describing the controlling chemical, and biological processes in quantitative form mathematical models) will be possible.

ntists are developing with unprecedented speed the nechnological tools (in situ and space-based measurements, s, and communications) for a holistic analysis of Earth's hese tools could enhance the ability of science to predict n the environment.

xponential growth in population, agriculture, and indusr activity is becoming a powerful factor, or forcing funcglobal change.

capacity of the global life-support system to sustain a ally advanced and exponentially expanding civilization to collapse within the foreseeable future.

recent developments have pushed global change and envil policy issues on center stage. One such development is ent scientific prediction of a rise in global temperature of grees centigrade as a result of increased emissions to the re of greenhouse gases, which trap long-wave radiation g from the Earth's surface.

Another development that has pushed global change into the limelight is the sharp seasonal decrease of the stratospheric ozone layer over the Antarctic and signs of incipient decline over the Arctic. By 1987, the evidence for ozone depletion was so persuasive that international agreement was quickly reached on the Montreal Protocol to limit the production of CFCs. Already this year, a number of countries have announced plans to accelerate the protocol's implementation by banning certain CFCs entirely by the year 2000.

A third development is the annual loss of more than 10 million hectares of forest cover in the tropics. In industrialized countries, millions of hectares of forest are destroyed each year by fire, and many more millions of hectares are jeopardized as a result of acid deposition. Worldwide, the rate of forest loss is about 1 acre (or 0.4 hectares) per second. At the same time, more than 5 million hectares of new desert are formed each year as a consequence of land mismanagement in semi-arid regions. Finally, the rate of extinction of plant and animal species has reached alarming and probably irreversible levels. This loss is robbing future generations of valuable resources for food, industry, and medicine. All of the developments have helped to heighten the public's awareness of global change. The global awareness of the gravity of the situation has been translated into political action.

* In the United States, two dozen bills concerning the environment were cosponsored by more than 400 senators and representatives during the 100th Congress (1987 and 1988).

* In his 1988 campaign for the U.S. presidency, George Bush promised to convene an international conference on global warming during his first year in office.

* Last fall, in a speech to The Royal Society, Great Britian's Prime Minister Margaret Thatcher labeled protection of the balance of nature as one of the "great challanges of the late twentieth century."

* At their December 1987 summit meeting in Washington, D.C., General Secretary Mikhail Gorbachev and President Ronald Reagan agreed to a collaboration on issues of climate and environmental change.

* In his December 1988 address to the United Nations General Assembly Gorbachev remarked that "international economic secur

ity is inconceivable unless related not only to disarmament but also to the elimination of the threat to the world's environment."

• In his 1988 World Environment Day message, Mostafa Tolba, Executive Director of the United Nations Environment Programme (UNEP) warned that "it may take another 15 years before scientists can give reliable predictions of what warming will mean in each region. But by then it may be too late to act." He called on political and industrial leaders to cooperate with one another and with climate scientists to finance more international research and coordination that will produce information more quickly.

In April 1987, the World Commission on Environment and Development analyzed and explicated these issues in Our Common Future, the report commissioned by the United Nations General Assembly. The commission argued persuasively that the issues of human and economic development requires a sound environment and a strong natural resource base, and an unhealthy environment and resource depletion ensure poor development. The commission urged expansion of the role of the scientific community in planning, decision making, and implementing measures for coping with climatic change.

In September 1987, several member countries of UNEP signed the Montreal Protocol. The Protocol is very modest (and many say insufficient), but the fact that a precedent was established in arriving at a multilateral agreement somewhat offsets the disappointment of the compromises that became necessary.

In the summer of 1988, 300 experts in science, law, environment, and economics met at the World Conference on the Changing Atmosphere: Implications for Global Security in Toronto, Canada. The conference statement concluded that the gravity of the risk of global warming called for a 20 percent reduction in carbon dioxide emissions from 1988 levels by 2005. It urged support for such efforts as the World Climate Programme, the International Geosphere-Biosphere Programme, and Human Response to Global Change.

Scientific initiative: Scientific research on global change has opened out some of the most exciting research topics. These include Earth history, the forcing functions of global change, source availability. By documenting historical Earth processes and studying their results and by assessing present and anticipated anthropogenic impacts, future global changes might be predicted more accurately. Theories and models of future global change can be tested by comparing them to actual historical changes. Thus, Earth history will be exploited to identify the forces behind climate change and to investigate the coupling between biogeochemical processes and the physical climate (e.g., the connection between greenhouse-gas emissions and global warming). This work will require an extensive observation system to document past Earth processes and future environmental change.

Change in a human activity like land use can cause global change by disturbing carbon storage, nutrient cycles, the hydrologic cycle, atmospheric composition, and the reflection of solar energy from the Earth's surface. As global population grows and humans convert more and more natural resources into goods and services, anthropogenic perturbations of the environment can only increase. The rate of change itself may be a forcing function because the rate of change can affect the kind of change; short-term but extreme perturbations of Earth's system can cause more dramatic changes than do long-term, gradual perturbations.

the availability and distribution of renewable and non re resources. Although the force behind the change may be scale (like global warming), predictions of resource availa needed on a regional scale.

Earth Observing System: In the past, revolutionary in science have followed the development of an instrument bles scientists to observe in detail some aspect of the natur No single piece of hardware triggered the current revolution in Earth sciences. Remote sensing from spacecraft toge the communications and computation capability now availa stimulated a holistic view of this planet and its atmosphere land, fauna and flora.

Developing Countries: One major challenge is to ensur involvement of developing nations in IGBP. A particular o ity for them is afforded by the proposal to establish stra located geosphere-biosphere observatories dedicated to tra research. It would be tragic if the use of high technology sensors, communications, and computers precluded the p tion of scientists from developing countries. The global po that must be resolved in the years to come will require th of every nation. The most effective way to ensure this s to make specific provision for their participation in the ment of the knowledge base that will underpin those dec this way, each nation will realise the necessity of and wor a convergence of international interests and aspirations. T nitude of the task of unifying policies in developing and d countries was revealed at the recent meetings in New D London. These meetings underscored the need to cooperate lish the baseline that will make the difficult decisions Indeed, more and more, scientists are realizing that the sm visible Earth system belongs to one indivisible world an is insufficient to study one society in isolation from al

The global changes clearly visible on the horizon are the scientific and technological advances that have unlock of the secrets of matter, energy, life processes, and inform made this knowledge accessible for human purposes. Th for society are three:

• permitting civilization to be snuffed out by savaging t environment with the weaponry scientific knowledge has m able;

• allowing the global environment and civilization to ually suffocated by exponential population growth and unc and inequitable transformation of natural resources into and services that sustain and give meaning to life; and

• planning and constructing a more prosperous, just, a world.

The coming decade will be one of the more critical i the several million years of human evolution. If humans view safely the changes that clearly lie ahead, each da marked by discrete progress toward a better world. Know fruit of scientific enterprise, is the sine qua non of such However, the first step perhaps is to "reaffirm a robust fa destiny of man." It is the unique privilege and challe generation to open this window of opportunity into that be

— T.P.

Mission Planet Earth Revisited — Thomas M

Vol. 31, No. 31

HEMARENA

VENKITESWARAN

Drug Industry — More Mergers and Joint Efforts

osts of development of new drugs have gone up to eights that few among even the top companies can survive and fluorish over the years. Profit margins erally the highest in the chemical sector but so also & D and sales costs, reaching up to 20% on sales or The time lag between patent grants and final approv- commercial sales is so long that the patent coverage hort — to some extent now modified by the recent ments. Also the development of a drug, and its clear- rough several stages of tests at various levels is so cated that often a single producer finds himself at a antage. These considerations have resulted in a spate rgers or acquisitions even between the leading firms. of the major such links in the recent past is given below.

erican Home Products acquired A.H.Robins
tman Kodak acquired Sterling Drug
ns acquired Pennwalt's drug sector
ne Poulenc acquired Monsanto's analgesics
nson & Johnson/Merck acquired ICI's Over The Coun-er Drugs
rel Dow merged with Marion Lab.
tol Myers merged with Squibb
cham merged with Smith Kline
vo merged with Nordisk

ay be noted that the mergers or aquisitions are selective where the new segment will be complementary to existing operations or add to strength in marketing or avoid future conflicts or patent disputes etc. In the case of large firms like Monsanto or ICI America the reason is also to cut out less profitable sections. The most notable feature is a new line-up in antibiotics through mergers which run across the continents though Japanese companies do not figure much.

Even more significant is the trend to link up in joint R & D for new drugs. Till recently this was confined to sponsored work at universities but now it has spread to joint work by two separate companies who have complementary expertise. The most notable case is of Merck (No. 1 in pharmaceuticals) and DuPont (No. 1 in chemicals) for R & D in development of drugs for treatment of hypertension and other heart ailments. Merck has expertise in drug development while DuPont has many potential items on line such as the Angiotension II Receptor Antagonists. DuPont will receive marketing rights for two Merck products — Sinemet for Parkinson's disease and Vaseretic for hypertension. Merck hopes to strengthen its long-term position. They have the best expertise in chemical trials and the complex regulatory review process for F.D.A. approval. Merck was also prompted by the Bristol Myers Squibb merger and of Smith Kline-Beecham. Merck has already joined up with Johnson & Johnson to convert some of J & J prescription drugs into the easier OTC market.

Chemical Plants Tackle Environment Strictures

nical Business of Oct. 1989 describes how nine large had to face up and tackle the newer regulations on ons into the environment — a small case study. Air ions, water pollutants, solid wastes and even more tant plant safety and hazards elimination today account ng share of capital costs, which are already much higher he investment on older plants. Many producers find it better to add a new production line to an existing plant at an older site. The public seems to be averse to any arge chemical complex in their neighbourhood — the al effect or NIMBY syndrome.

rsanto Chemicals have expanded maleic anhydride by adding a new line to make it 24[illegible] mill lbs a year [illegible] The present permitted levels of discharge are not exceeded by improvements and process modification. Hydrocarbon emissions are below the permitted 40 t/year. Off gas is used as air in the steam generating plant and burns off residual organics.

Huntsman Chemical Co. has expanded and improved polystyrene production and is adding 70 mill lbs of capacity without adding to permitted waste levels. Water is recycled and emissions are under state of the art controls. Waste polystyrene is reground and reused and there is no landfill required.

Occidental Chemical have built EDC capacity — 80 mil lbs — at their Corpus Christi [illegible] site. Air and water discharge permits were procured and incinerator keeps the levels of pollutants within limits. Waste water is stripped of EDC and part of the process waste stream comprising trichlorethane is sold to BF Goodrich for use as feedstock for their EDC.

Dow Chemicals have built up an extraction plant for benzene from pyrolysis gasoline of naphtha cracker and new permits were not required. Waste gases and waste process air go to an incinerator — anything that cannot be recycled is incinerated. Steam stripping removes impurities from process and storm water before discharge into the river. Rotary Kiln incinerator burns all solid wastes.

Vanillin plant of Rhone Poulenc has been operating since 1920 but now the process has been changed with expansion and emissions kept within permissible limits. There is no air emission but waste water containing phenols are to be reduced to below 15 ppb levels — through chemical and biotreatment. The odour of Vanillin persists but nobody has any complaints about it.

Quantum Chemical is expanding ethylene capacity by 1.5 billion lbs. contiguous to an existing plant. But they had to provide the complete environment impact statement and provide facilities for reducing the main pollutants of nitrous oxides through the special burners and also a byproduct gas purification system to recover and use hydro cated waste water treatment is required for t for quenching cracked gases.

FMC have added sodium cyanide capacity a problem by making a 30% solution instead o product. The market is nearby and the sale of so comed by the users. Fluorinated ethylene prop to be made by ICI America at a PTFE plant si a proprietary technology and emissions are han of-the-art stack gas analyser and treatment. W wastes cannot be reused or sold are handed ove transporter and disposed. Solvents not reclai and sulphuric acid wastes are treated by kno

Sherex Chemicals make a very hazard —aluminium alkyls and all processes are unde gen blanket and a closed system. A flare system of the flammables in waste air and all process to this flare. Solid wastes which arise, most compounds are presently stored.

These examples show that chemical manufac are alive to the new stricter regulations and com using newer disposal methods available. The i waste gases seems to be an essential part of and petrochemical operations.

Hindustan Lever's breakthrough

It is very gratifying to note that Hindustan Lever Research Centre in Bombay have been able to achieve a significant development which can reduce the requirements of fats and oils for the soap industry. Soaps with lower levels of total fatty matter — TFM — with equally efficient cleaning power are possible. It is known that the palmitic and stearic acids of fat do not contribute to cleaning power but only gives body and firmness to the soap. The technology under development by HLRC is to reduce the TFM content from 76-80% to about 60% and adding non-fatty structurants. But the practical aspects are not yet clear — as to the removal and use of the enumerated fatty acids. There is a large small scale sector of the soap industry which is incline directly and even the glycerine is lost. The use o acids by the cottage sector will be a breakthro of Alpha olefine sulfonate as a component is to play a major role in the coming years.

The major build-up component, STPP — S lyphosphate — continues to dominate the dete try and there is no easier or lower priced alt hopes that the country can reduce the need fo for soaps and of even more importance get fatty stitute for fats to a larger extent.

Plastics for Autos

Data on the place of polymers and plastics for automobiles as of 1988 is given in a recent issue of ECN. The world production of synthetic rubbers is 9.5 million tonnes and of tyres is over 900 millions. The use of plastics per passenger car has gone up to 27 kgm (average) and this is made up of

Polypropylene — 29%
ABS — [illegible]
[illegible] — [illegible]
[illegible]
Polyphenylene oxide
Others

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Cold fusion in a drawer

Health physics scientists of the Bhabha Atomic Research Centre (BARC) were unwittingly sitting over evidence for cold nuclear fusion which they had in their table drawers for the past 15 years, according to Dr. M. Srinivasan, Head, Neutron Physics Division.

Some curious finding to this effect has recently been unearthed by Dr. Srinivasan and other nuclear physicists working on cold fusion at BARC. They claim to have found evidence to indicate that deuterium contained in old deuterated metal targets in the possession of Directorate of Health Physics of the BARC had undergone fusion leaving behind tritium in the metal matrix.

Presenting these findings at the special informal discussion session on cold fusion held at the ongoing 32nd DAE Symposium on Solid State Physics on December 19, Dr. Srinivasan said that these evidences constituted results of "a 14-year long cold fusion experiment". Normally these metal targets cannot have any tritium in them and certainly not at these high levels as have been detected, Dr. Srinivasan said.

The Health Physics Division had apparently been importing deuterated titanium and deuterated copper-titanium targets for use in radiation measurement devices for over 15 years now and some of these had remained unused in the table drawers of some scientists for as long as 14 years. Dr. Srinivasan showed two such tritiated metal targets, one a deuterated titanium target imported in 1981 from the British company Amersham International Pvt. Co. Ltd., and the other a deuterated copper-titanium target imported about 14 years ago. It should be remarked here that titanium has been one of the metals used in the recent cold fusion experiments — both the electrolysis kind and the high pressure loading of metals with deuterium gas kind — indicating that probably solid state properties of such metals catalyse d-d fusion in some unknown way.

In "auto-radiography images" of these metal samples the entire areas of the photographic films in contact with the metal surfaces had become completely black indicating thereby that radioactive tritium produced by the fusion of deuterium present in the metal matrix had accumulated everywhere in these targets. Autoradiography is very much similar to X-ray radiography except that instead of external radiation source, here the radioactive material itself acts as the source of radiation for imaging.

The levels of absorbed deuterium gas in these metal foil targets, which are about a couple of mm thick and a few cm in diameter, is of the order of 3-4 millilitre. The tritium level detected in the first sample was as high as 6 millicurie, corresponding to a tritium to deuterium ratio (t/d) of five in 10,000. Similarly the copper-titanium matrix gave a tritium level of 900 microcurie giving a t/d value of eight in 100,000. Dr. Srinivasan claimed that the methods adopted for detecting tritium are totally unambiguous.

Surprised at these findings the BARC scientists apparently contacted the British firm by telex to find out whether there was any possibility of tritium contamination in their samples. "We do not expect any trace of tritium" was the reply received. Taking into account the escape of tritium from the metal as well as the radioactive decay of tritium, a backward projection from the detected amounts of tritium show that about one fusion reaction per trillion pairs of deuterium nuclei may have occurred initially. The heat production in the original "test-tube" experiment of Pons and Fleischmann corresponds to one fusion reaction per 10 billion pairs of deuterium nuclei. The probability of occurrence of d-d fusion in free space is as low as one in 10[illegible] and when deuterium is absorbed in metals that have great affinity for hydrogen and its topes, such as palladium and titani various calculations have shown this probability can at best be increa to one in 10[illegible]. It is this extremely rate of d-d fusion that the Po Fleischmann experiment implies, much as 16 orders of magnitude hig than the most optimistic estimate, wh cannot be explained by known phys

Apart from the fact the different p itive claims for cold fusion have been produced by independent resea groups, inexplicability in terms known physics has been one of the reasons for the ongoing controversy disbelief in cold fusion. The Bha Atomic Research Centre has been of the few research groups around world that has maintained that "c fusion is for real" and they have eno evidence to prove it. Now it would s that they have moved from test tube table drawers.

ICMR TERMS U.S. DOCTORS CLAIM MISLEADING

The Indian Council of Med Research (ICMR) has objected to publicity given by Doordarshan other media to a herbal drug that is s posed to prevent heart attacks. ICMR described as "misleading" claims by two American doctors at just-concluded world cardiology con ence at New Delhi that the drug m from Himalayan herbs prevents h diseases and has anti-cancer proper Reacting to the publicity given to drug by the media, the IC Director-General, Dr. A.S. Paintal, it was "unfortunate and unethic because it literally amounts to adve ing a brand drug whose efficacy is proven scientifically".

In a letter to the Director-Genera Doordarshan, the ICMR said "It is considered opinion that the new should not be telecast unless veri for it can do more harm than benef public.

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Steep rise in Cauvery basin crude output

The Oil and Natural Gas Commission has raised the production target of crude from the Cauvery basin during the Eighth Plan in view of the "recent significant" discoveries of hydrocarbons in the region.

Such significant strikes of hydrocarbons have been made in the onland and offshore parts of the basins. On the basis of these, ONGC has hiked its terminal year target of crude production there for the Eighth Plan (1994-95) from two million tonnes per annum to 3.5 million tonnes annually, official sources at New Delhi said.

Meanwhile, production of crude from the basin from April to September, 1989 steeply increased from 200 tonnes per day in the beginning of April this year to 700 tonnes daily at the end of the period. The earlier target of production for 1994-95 was two milion tonnes per annum the sources said.

The entire production from the Cauvery basin is being entirely sustained through the 'early production systems' at Narimanam, Bhuvanagiri, Nannilam and Adiyakamangalam. The development scheme for many of these structures is being worked out at the Institute of Reservoir Studies in consultation with the reservoir engineers of the region, the sources said.

Drilling was now in progress at five new structures — Kaudayur, Needamangalam, Vattikadu, Mongudi and Kottarkudi onland. A number of exploratory locations with similar objectives have been identified after critical review and will be taken up for drilling. The number of rigs deployed in the Cauvery onshore and offshore is expected to be increased to 16 at the end of the Eighth Plan in 1994-95 from the existing ten, the sources said.

The development of the Cauvery offshore structure is also being taken up in a phased manner. A detailed Rs. 325-crore scheme has been prepared for the PY-3 structure in the basin, the sources said.

MANUFACTURE OF DIAGNOSTIC KITS: NICCO TIES UP WITH GLOBAL TEK

The Nicco group has taken the first tentative step in the area of biotechnology. The group has tied up with Global Tek of Canada to manuacture diagnostic kits. Addressing a press conference at Calcutta, Mr. Rajiv Kaul, chairman of the group, said that Global Tek manufactures diagnostic equipment for testing viral infections.

The objective of the joint venture, in which Global Tek is to have a 40 per cent equity stake and the balance controlled by Nicco, will be to manufacture these kits in India in the final phase of the project.

To start with the kits will be imported. The items are under OGL and duty free import is allowed. Mr. Kaul emphasised that Nicco is not in any way getting into medical services. The company will just market the products and also provide training facilities to users in the early phases. The users will mostly comprise nursing homes and health service organisations.

Dr. Diane Vanalstyne, the promoter of Global Tek, said that these kits which would carry out any type of viral test was not just simple to use but was also inexpensive for the patient. For instance a mumps test would cost only Rs. 30 The equipment costs around Rs. 60,000

Global Tek is working on developing a diagnostic kit for home use. The prototype is ready, pending patent protection. This technology will also be transferred to Nicco later.

Dr. Abhijit Sen, vice-chairman o Nicco group said the project cost in th initial stages would not be more tha Rs. 1 crore, however, depending o market acceptance of the product an with the induction of newer products th project cost in the final phase was like to be about Rs. 10 crores.

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uclear medicine to cure heart disease identified

Nuclear medicine", a fast develop- modern branch of medicine which ses radio-isotopes in diagnosing and apy, can do wonders in attending to rt and bone diseases and different es of cancers, experts say.

At the international seminar on clear medicine which opened at cknow recently at the Sanjay Gandhi st Graduate Institute of Medical iences (SGPGI), experts highlighted e importance of nuclear medicine and id radio isotope techniques had made possible to quantify the body fluids cluding the 'enzymes and hormones'. he Radio Immune Assay (RIA) helped emendously in diagnosis and man- gement of various diseases hitherto not ithin the reach of physicians.

Various soft tissue organs like liver d kidney which could not otherwise e easily seen, could new be visualised form of 'radio isotope scans'. In the- apeutic use, an operation could also be voided as isotope injected into the cir- ulation destroys the cells causing amage to the tissue, the experts said.

The experts however regretted that ndia had only 59 nuclear medicine cen- res, mostly located in the big cities.

On the other hand, China had as nany as 800 nuclear medicine centres nd in Russia 400 such centres were lready in operation, they said.

Dr. B.K. Das, the organising secre- ary of the conference and head of the Nuclear Medicine Department at SGPGI, said the institute was going to start such facilities very soon.

The conference, organised in collaboration with the Indo-American Society of Nuclear Medicine, is being attended by about 200 experts including scientists from the US, Japan and Germany.

GRASIM TO OFFER KNOWHOW FOR AP RAYONS UNIT

Andhra Pradesh Rayons, an associate of Ballarpur Industries of the Thapar group has entered into technical collaboration with Grasim Industries for its new viscose staple fibre plant to be located at Kamalapuram in Warangal district.

The Chairman of Ballarpur Industries, Mr. L.M. Thapar, told newsmen that the plant, with a capacity of 70 tonnes per day, is to be set up at a cost of Rs. 75 crores.

However, in the first phase, the production will be 45 tonnes per day. The plant is likely to be commissioned in two years time after the issue of the letter of intent which is awaited, he said.

According to the agreement signed on December 18 at New Delhi, Grasim Industries will supply technical knowhow, plant and machinery and assist in erection and commissioning of the unit.

AP Rayons has opted for Grasim's technology after evaluating in detail various alternative technologies. Grasim enjoys an excellent reputation both in India and abroad, as a manufacturer of sophisticated staple fibre plant incorporating the latest state-of-the-art technology.

The agreement was signed by Mr. Thapar and the president of Grasim Industries, Mr. I.H. Parekh.

AP Rayon's decision to go in for a downstream fibre project will enable the company to get higher value addition and increase profitability, Mr. Thapar said.

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Hindustan Fluorocarbons may merge with HOC

Hindustan Fluorocarbons Ltd. is likely to be merged with its original promoter, Hindustan Organic Chemicals (HOC). A proposal has been put up by HOC for consideration of the Industrial Development Bank of India (IDBI). HOC, owns 51 per cent of the total equity of Rs. 11.86 crores, with the Andhra Pradesh Industrial Development Corporation (APIDC) and the public holding 11 and 38 per cent respectively.

If the merger comes through, HOC could offer to purchase equity from the public at a predetermined price. In turn, HOC could get income tax benefits with Hindustan Fluorocarbons running up to a huge loss of Rs. 10.38 crores as of March 31, 1989. Hindustan Fluorocarbons has sought financial reliefs like suitable restructuring of existing loans, grant of concessions regarding interest besides extending additional financial support from the Centre, but the response has not been warm.

Hindustan Fluorocarbons is the sole domestic producer of PTFE in the country but has never been able to utilise its installed capacity. The installed capacity is put at 500 tonnes per annum while production in 1988-89 is put at 138.372 tonnes. Cheap imports is given as the reason for the poor performance but none is prepared to buy the argument.

At a ministerial meeting in Delhi on December 1, the company management pleaded for bringing the import of PTFE from OGL to the restricted list thereby creating monopoly selling condition for the company. It may take some time for the Government to decide.

At present the company is selling PTFE at a price lower than the landed cost of imports and any restriction could imply higher prices. Earlier the company had technical problems which it is supposed to have solved.

MEDICINAL USE OF NICOTINE

Nicotine, the drug inhaled by cigarette smokers, can help sufferers of Alzheimer's disease, according to psychologists. "Giving nicotine resulted in the patients becoming more alert, responding more vigorously and doing better on a variety of mental tests", the Reading University Psychology Professor, Mr. David Warburton, told a conference of the British Psychological Society, recently.

In the Alzheimer's study, Prof. Warburton and his colleagues, Dr. Barbara Sahakian and Dr. Gemma Jones, matched 39 Alzheimer's patients with a group of elderly people of the same age and intellectual ability at London University's Institute of Psychiatry. Composed to a placebo, nicotine increased the alertness of patients who suffer from premature senile dementia symptoms associated with Alzheimer's, although it did not improve their memories, the psychologists said. Prof. Warburton said he would not prescribe cigarettes to his patients.

"My colleagues and I have never at any time recommended patients smoke cigarettes", the psychologist said. "We are experimenting with safe ways of giving nicotine, for example, through a specially impregnated path on the skin.

UNICORN ORGANICS

Unicorn Organics, after establishing itself as the second largest manufacturer of sorbitol in India, is now looking for further growth and diversification. The company commenced commercial production in November 1989 and has already achieved 90 per cent of its installed capacity and started earning cash profits. From 3,600 tonnes per annum of sorbitol, the company is in the process of doubling its capacity to 7,200 tonnes. The company is also diversifying into the manufacture of mannitol and anhydrous dextrose at a project cost estimated at Rs. 179 lakhs.

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IDL project to make gypsum bricks

The Secunderabad-based IDL Chemicals Ltd. is putting up a project in technical collaboration with Salzgitter Industriebau GmbH, West Germany, for converting waste materials from fertiliser units into value-added products, which can replace bricks for all non-load bearing walls.

IDL, which is part of Dyno Industries of Norway, will be making this product, gypsum building materials, considered as the international dry construction alternative, for the first time in the country.

The project, being put up at a cost of about Rs. 11 crores, assumed special significance as the fertiliser industry generated huge quantities of phosphogypsum from phosphate fertiliser plants, apart from natural gypsum available in plenty. An estimated two million tonnes of phosphogypsum is generated every year in India as industrial waste and it is likely to increase to three million tonnes per year in the near future.

With both natural gypsum and phosphogypsum available in abundance, this project is likely to rejuvenate the Indian construction market. To that extent, the Indian construction market though traditional practice, like using brick, cement and concrete, has shown receptiveness to newer concepts of building materials and structural practices.

So much so, even the technical collaborator Salzgitter AG, which is one of the largest corporations in West Germany and is fully owned by the Government, convinced of the Indian construction market's potential, has made it clear that it is not averse to have an equity participation in the IDL Chemicals in the near future.

Having realised the need and scope for enlarging the spectrum of building components, the Government of India has set objectives for better materials management and gypsum building materials suited to the Government objectives fully. The objectives of the Government in accordance with its national housing policy encourage use of innovative building materials which have some noteworthy factors.

They are utilisation of industrial wastes, conservation of non-renewable wealth, conservation of energy intensive elements like steel and cement, manufacture of building elements at low specific energy consumption, encouraging the production of standardised building elements, prefab technology to facilitate speedier construction and development of architecture relevant to Indian conditions. Gypsum products, strongly recommended for non-load bearing interiors in India, is being widely used in Germany, France and Mediterranean countries.

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KERALA TO STUDY RADIATION IN COASTAL AREAS

The Department of Atomic Energ (DAE) has sanctioned a Rs. 36-lak project to the Regional Cancer Centre a Trivandrum to conduct a study on th effect of natural background radiatio in the coastal areas of Kerala. Kerala one of a very few places in the world f cing the danger of high background r diation which is believed to cause adverse effect on the health of the po ulation.

An official release said that the bac ground radiation in the coastal areas Kerala was 10 times higher than permissible radiation level. This w mainly due to the presence of radiac minerals, it added. The study, wh would be conducted in Karunagap taluk in Quilon district, was aime finding out if there was an ac increase in the incidence of cance areas in Kerala where there was a background radiation.

1 REFINERY:

PM to lay stone early next year

Prime Minister, Mr. V.P. Singh, the foundation of the fourth oil y in Golaghat district of Upper during his proposed visit to the in the first week of January, ing to the Assam Chief Minister, afulla Kumar Mahanta. Inaugur- he station building of the Assam Transport Corporation at Nagoan ly, Mr. Mahanta said the refinery, under the Assam accord, would 'new year gift to the people of .

hoped that with the installation of National Front Government at the re, the over-delayed payment of ty of oil and construction of the ghopa-Pancharanta bridge across Brahmapurtra would now materia- soon. He said there are about nine unemployed youths in the State and Government is giving priority to employment.

Ir. Mahanta said the State Govern- t is demanding scrapping of the DT Act, 1983 and taking up mea- s for permanent control of floods. erring to the on-going construction he Assam-Bangladesh border road, Mahanta said he is optimistic about y completion of the border road and ing. He said the matter of illegal upation of a portion of the border by Bangladesh has been taken up h the Centre and there are positive s that the work would be done very n

JOINS RACE FOR PETRO- EM PROJECT

Another name was added to the list suitors for downstream units of the ldia petrochemicals project. It was turn of the JK group. The group's resentatives stalked the corridors of state secretariat waiting for an pointment with the finance minster, Asim Dasgupta, to place before him a proposal for a downstream project. The initiative has come from Mr. Bharat Hari Singhania who is willing to invest anything between Rs. 300 to Rs. 2,000 crores in a downstream unit. The group has interests in petrochemicals and related projects in the shape of JK Synthetics, which manufactures polyester staple fibre.

A spokesman of the group said a downstream project has to have synergy with the group's operations in petrochemicals. For instance, butadiene a petrochemical by-product obtained by cracking naphtha, is a basic raw material for the manufacture of tyres and the group has JK Tyres involved in the business.

HARYANA PETRO

Haryana Petrochemicals Limited has reported encouraging working results for the first six months ended September 1989. The net profit after tax is estimated at Rs. 145.86 lakhs (Rs. 133.03 lakhs). The turnover rose to Rs. 1,315 lakhs (Rs. 1,109 lakhs).

The first phase of expansion of the spinning capacity from 3,000 tpa to 7,000 tpa has been completed and the unit has also commenced commercial production in mid-October 1989, around two-and-a-half months ahead of schedule without any cost overrun, according to the company press release.

In view of the expanded capacity the profits of the company are likely to be double of the previous year. The financial institutions have approved its second phase of expansion, costing Rs. 52 crores that will further increase its spinning capacity by 2,500 tpa and the company would set up a captive polycondensation plant with a capacity of 7,500 tpa.

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Gas victims developing heart ailments

The presence of toxic cyanide and thiocyanate in the bodies of those affected by the 1984 gas leak is causing cardiac ailments, dimmed vision and psychic and psychosomatic disorders besides kidney, liver and anaemic problems, says a medical researcher. Dr. Gulzar Ahmed, a physiologist doing independent research on the gas victims for the last five years, said cyanide was blocking oxygen metabolism in body tissues and inhibiting energy synthesis which was causing heart attacks and kidney failure.

Secondary health problems were developing as a result of thiocyanate which was affecting thyroid secretion mechanism by blocking iodine metabolism and causing hormonal imbalance. A majority of the gas victims who were administered sodium thiosulphate, the anidote for cyanide poisoning caused by inhalation of methyl isocyanate (MIC) were facing thyroid disorders, he claimed. Dr. Ahmed said that his observations were based on a five-year-long study of about 30 dogs including fourteen bitches in the puberty-menopause stage and a general survey of about 200 people of different age groups and backgrounds, besides plants, particularly cactus. Dr. Ahmed said the molecular effect of gas poisoning was observed in the photosynthesis mechanism in plants and energy synthesis mechanism in cellulur power houses (mitochondria) of both animals and humans. The biochemical substances affected by the poisoning were chlorophyll in plants and haemoglobin and cytochrome enzymes in blood and mitochondria, respectively.

He maintained that indiscriminate administration of sodium thiosulphate caused more complications for the gas victims. Administration of the antidote was much better at the initial stage, but administering it without it improving damaged lungs, liver and kidney was proving hazardous and leading to physiological malfunctions.

PETROLEUM: NEED FOR LONG-TERM PLAN STRESSED

Mr. M.S. Gurupadaswamy, Minister for Petroleum and Chemicals, has expressed the desirability of chalking out a 10-yr. strategy to tackle the needs of the petroleum industry. Stating this while delivering the valedictory address on the concluding day of the Petroleum Pipeline Technology Concerence (PPTC), organised by the IOC, in Delhi.

Mr. H.K. Khan, Secretary, Ministry of Petroleum and Chemicals, exhorted experts among the 200-strong audience to come up with suggestions and proposals to improve the plan and make i more effective. Mr. Khan assured oi transporters of "total support" if the Government receives any economicall viable and efficient proposals fro them.

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Study moots MNC drug companies nationalisation

ionalisation of multinational com- s (MNCs) and giant monopoly s in the drug industry is necessary isure that drug are available at dable prices to the consumers, rding to Mr. P. K. Chopra of ikshetra University. In a study he suggested that tax on drugs partic- y life saving drugs should be done y with, as such a tax was on health.

urther in order to ensure the avai- ity of drugs at affordable prices, the ernment should establish procure- nt and distribution agencies both at Centre and the State level as in the of foodgrains. A reasonable profit gin should be fixed for chemists and r retailers. Doctors should be trained rescribe cheap and relevant single- edient drugs and to avoid over- cribing.

he production and sale of all drugs uld be made under generic names y. All harmful, superfluous and irra- nal combination drugs should be laced by useful single ingredient gs and only a few most-needed drug nbinations, he says. Elaborating the dy states that the present pricing ucture is intricate, exparte and anti- ople, the drug price control system s remained ineffective throughout and resultant price distortions apparently ploit the consumers.

The MNC drugs are over priced and re so when compared to indigenous ugs. They generate excess monetary rdens on consumers in that it varies tween 50 per cent and 1400 per cent. ctually 70 per cent of the drug market controlled by 63 MNCs, who with the lp of high pressure market techniques ve maintained their hold on the arket. The method of transfer prices elps them to maintain their control over e market, to mitigate the impact of rice controls, to minimise taxes and her payments to Government.

The Government's policy of import liberalisation to MNCs neither results in self-reliance nor in the development of the drug industry nor for that matter in the betterment of the Indian sector of the industry, Mr. Chopra says. Most of the branded drugs even when containing the same ingredients differ greatly in their respective prices.

The prices of stripped drugs are higher than those of loose drugs. Amazingly drug prices are never revised downwards with the fall in the cost of materials, Mr. Chopra claims. The new drug policy announced in 1986 has an escalatory effect on drug prices and adverse impact on the poor consumers. The number of drugs under price control has been reduced while the mark ups have been increased from 40 and 55 percent to 75 and 1000 per cent respectively.

PRICES EQUALISATION ACCOUNT: DRUG UNITS TO PAY ALL DUES

Pharmaceutical units have agreed in principle to pay up all dues under Drug Prices Equalisation Account (DPEA). The perceptible softening follows the Government resolve to set off dues to companies from earlier claims. In a couple of months, most, if not all, companies will be closing claims on them by the Government. Claims under DPEA fall under two categories. The first are those arising from the Supreme Court order on drug over-pricing. Under this category, total dues are put at around Rs. 13 crores and reports are that a large amount has been paid up.

Hoechst, in full and final settlement, paid up Rs. 3.12 crores against a claim of Rs. 4.58 crores, with the lower amount being explained by set offs given by the Government. Even as companies have been overcharging, they have been losing on production of bulk drugs and formulations, raising claims and counter-claims, to form the second category.

Rifampicin manufacturers have been the most prominent in this group with total amounts assessed at around Rs. 9 crores. It is a fact that a couple of years ago, rifampicin units absorbed margins arising from a drop in world prices of the drug. The Government refused to act by bringing down formulation prices. But the industry got it back when world quotations of rifampicin soared and the Government refused to oblige.

In the last one year, the Government misives went to about all the drug units covering the entire category of drugs falling under price control.

SHRISHMA FINE CHEMICALS & PHARMACEUTICALS LTD.

Shrishma Fine Chemicals & Pharmaceuticals Ltd., has turned the corner for the period ended March 31, 1989. It has earned a cash profit of Rs. 11.47 lakhs against a cash loss of Rs. 90.11 lakhs for the previous year.

The sales have risen to Rs. 21.50 crores from Rs. 8.35 crores and operating profit has more than doubled to Rs. 2.68 crores from Rs. 1.13 crores. However, after making necessary provisions, the company has incurred a nominal loss of Rs. 6.02 lakhs against the previous year's loss of Rs. 1.27 crores.

According to Mr. S. N. Chaturvedi, chairman, the company's performance would have been better had the government not taken the step of reducing the selling price of aspirin from Rs. 80 per kg. to Rs. 71 per kg., in first half of the current year ended September 30, 1989. The turnover during the period has been marginally higher at Rs. 15 crores as against Rs. 14.17 crores in the corresponding period of the previous year. Gross profit has been higher at Rs. 1.65 crores as against Rs.1.39 crores.

Drug units urged to step up modernisation efforts

Prof. M. G. K. Menon has appealed to the pharmaceutical industry to keep pace with the modernisation of this sector worldwide, and at the same time to make available at cheaper rates, drugs, particularly those required for fighting tropical diseases like malaria.

He was inaugurating the 41st Indian Pharmaceutical Congress at Bombay, recently.

He said modern biology, relative chemistry and other such developments have to be introduced to suit 'our conditions' so as to phase out the old concepts of manufacturing in this sector.

The mortality rate of 15.7 per cent could be brought down to 11.1 per cent thanks to the fast-expanding nutrition and health-care programmes. He said that the Hathi committee report submitted to the Government in 1975 on quality control, prices, environment and other programmes for development of the industry could still be implemented as it had the necessary suggestions for it to attain self-reliance.

However, he appealed to the industry to 'come under one roof' to fight with the help of the Government, the problems it was faced with.

Prof. Menon stressed the need for boosting exports as it generates employment as well as growth of the industry.

The Indian Pharmaceutical Congress President, Mr. Ajit Singh, urged the Centre to set up an institution on the lines of the Indian Institute of Technology in the engineering field, so as to train highly qualified hands for the industry.

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would also be released in the print media. "Unfortunately, it is not known that the power situation has been steadily improving since 1985", a state power department official said, adding that 1990 summer would be the last "agonising one" because after that new power generating capacities would be coming into stream in stages. The state thermal capacity had stagnated at the level of 1,938 mw since 1986.

The present uncertainty in power situation, sources said, was due to West Bengal Power Development Corporation's (WBPDC) failure to commission its two 210-mw units at Kolaghat as per schedule. This was due to ABL, boiler manufacturers, being closed for nearly two years. It is expected that there would be an addition of 1,848 mw, excluding those in DVC and NTPC systems, in generating capacity by 1995.

It is learnt that two 210-mw units at WBPDC's Kolaghat thermal station and one 67.5 mw unit at CESC's southern generating station would be commissioned next year. This would mean an addition of 487.5 mw in generating capacity.

The addition in generating capacity would be to the tune of 322.5 mw in 1991-92, 283.5 mw in 1992-93, 425 mw in 1993-94 and 330 mw in 1994-95. The units that would be commissioned during these years include two 210 mw units at WBPDC's Kolaghat plant, one 67.5 mw unit at CESC's southern generating station, three 210 mw units at WBPDC's much publicised Bakreshwar thermal plant, one 120 mw unit of CESC's Gouripur generating station, and WBSEB's 123.5 mw hydel units at Teesta, Rammam and Mongpu.

Sources said the power supply suffered a setback this year and the average load shedding hours per day amounted to 50 minutes because of the delay in commissioning the Kolaghat units. The average load shedding minutes per day which was 60 to 100 minutes during 1984-85 had decreased to less than 15 minutes during 1987-88. Power department officials are optimistic that there would be no load shedding after 1990.

Though such optimism is welcome, the track record of state power agencies does not inspire confidence that they would be able to commission so many new units according to time and cost schedule.

KOODANKULAM PLANT, A HEALTH HAZARD

The member of the Central Advisory Committee on Pollution Control, Prof. T. Shivaji Rao, warned that the proposed 2000-mw Koodankulam nuclear power plant to be built with Soviet assistance bristled with the incalculable health hazard due to 'Chinese syndrome'.

Presenting a paper at a seminar organised by the College of Engineering, Gandhi Institute of Technology and Management, Prof. Shivaji Rao explained the dangers inherent in the setting up of the plant including release of massive releases of radio active particles known as 'Chinese syndrome'.

Referring to the diseased management at Koodankulam, he said when radioactive elements are released due to an accident, there would be immediate fatalities and long-term genetic damages among the exposed populations and all people within the zone of influence from the reactors would also be exposed.

Prof. Rao also listed the villages and towns that would be affected seriously by the disaster. Many villages of Ramanathapuram, Tirunelveli and Kanyakumari districts and Trivandrum and Quilon would be affected.

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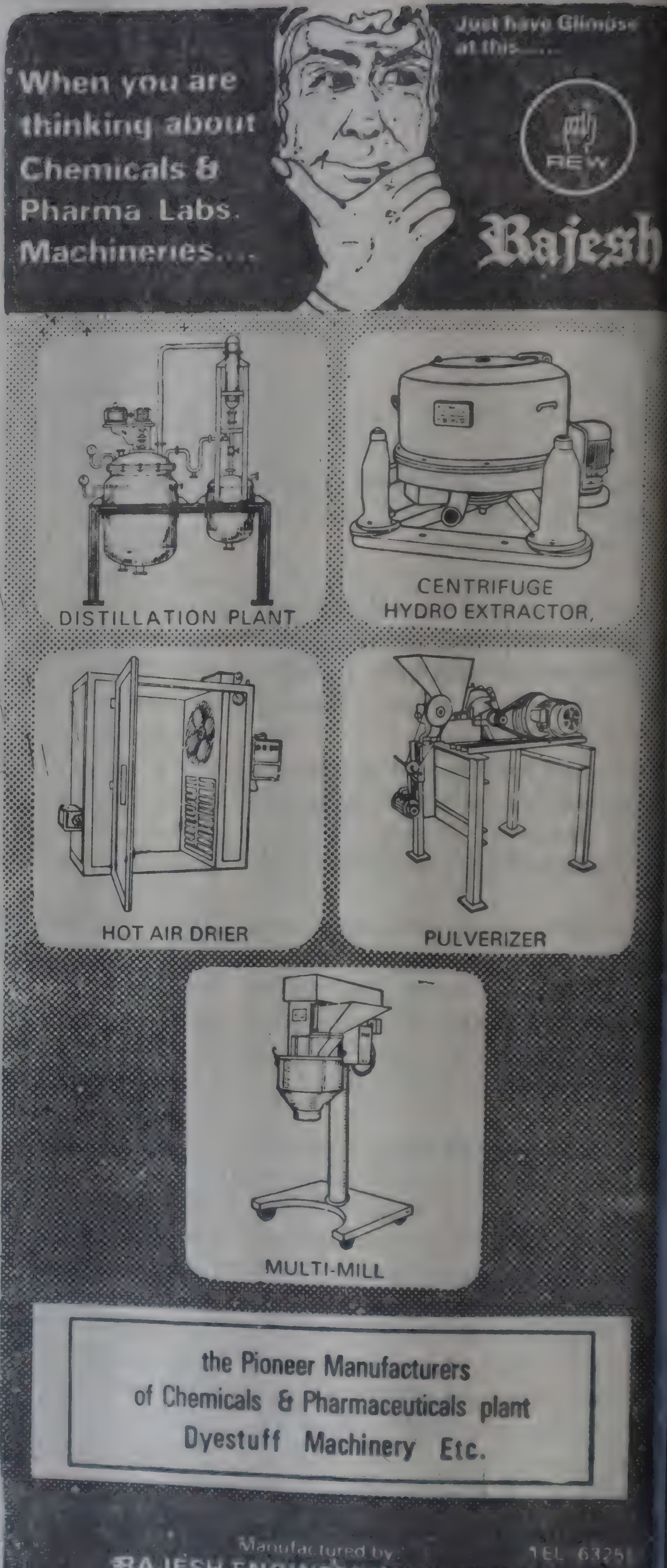
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Poly (Ethylene Glycol) (PEG) derivatives as PTC and solvents for organic reaction

G.E. Totten and N.A. Clinton (of Union Carbide, U.S.A.) have given a state-of-the-art-review on this subject. PEG's have often been described as poor man's Crown Ethers but have the advantage of very low cost and are not toxic. This review is classified in three parts : (i) PTC (ii) Supported Catalysts (iii) Reaction solvents. PTC: Phenytoin synthesis from benzil and urea; triaryl phosphates from phenols and $POCl_3$ (work by Krishna Kumar, Sharma and co-workers); N-alkylation of nitro heterocycles; dehydrohalogenation; carbonyl reduction with borohydrides; Williamson ether synthesis; polyether synthesis; aryldiazonium salt reactions; oxidation of benzyl alcohol to benzaldehyde.

Reaction media: Conversion of 4,4 dimethyl-1,3-dioxane can be carried out to give isoprene, with H_3PO_4 as a catalyst at 170°C.

PEG's have been found to be excellent catalysts and solvents for a variety of reactions. PEG should have molecular wt. above 200. The terminal group substitution can dramatically affect the reactivity. (*JMS-Rev. Macromol. Chem. Phys.*, 1988, **C28(2)**, 293-337).

MULTIPHASE REACTIONS

para Selective mononitration of alkyl benzenes

Smith **et al.** have shown that toluene and other alkylbenzenes can be mononitrated in essentially quantitative yield with high para selectivity, at ambient temperature by benzoyl nitrate in the presence of A1/proton exchanged large port mordenite. (*Tetrahedron Lett.*, 1988, **30**, 5333).

Oxidative conversion of aliphatic nitrocompounds to carbonyls using sodium chlorite and PTC

Ballini and Petrini have shown that $NaClO_2$ allows conversion of a variety of nitrocompounds to carbonyls (primary to aldehydes and secondary to ketones), with high yields, in CH_2Cl_2 — aq. NaOH, with Bu_4NHSO_4 as PTC. (*Tetrahedron Lett.*, 1989, **30**, 5333).

Quaternary ammonium fluorides (QAF) from corresponding other halides in solid-liquid system

Dermeik and Sasson have shown that both hydrophilic and lipophilic QAF can be prepared in high yields by direct exchange using solid KF, with an optimised amount of water, with methanol as a solvent. (*J.Org.-Chem.*, 1989, **54**, 4827).

Practical alpha-amino acids (AA) synthesis via PTC

O'Donnell and co-workers have described the first practical asymmetric synthesis of AA with PTC. For instance, 4-chloro-*D*-phenyl alanine of high purity has been made. This work is based on the original work of Dolling and co-workers (of Merck, USA) on substituted indanones where PTC derived from cinchonia alkaloids was used. Thus $Ph_2C = N\ CH_2\ COOR$ was used as the starting material (R is preferably tert butyl group). Cinchonine/cinchonidine catalyst was used. (*J. Amer.Chem.Soc., 1989*, **111**, 2353).

Bromomethylation of aromatics using PTC: Rapid bis-halogenation

Using tetradecyl trimethyl ammonium bromide with 1,3,5 trioxane and a mixture of 48% aq. HBr and glacial acetic acid allows more than 90% yield. (e.g. Benzene to benzyl bromide; toluene to para bromomethyl derivative). (*Synlet*, 1989, No.1, p. 55-56). (This is the first issue of a new journal for Rapid Communications brought out by "Synthesis").

Hydroformylation (oxo) reaction in two-liquid phases

Hoechst have claimed that higher olefins like hexene-1 can be subjected to reaction with water as an additional phase to facilitate catalyst recovery. Rh catalysis used with a water soluble triphenyl phosphine-m-trisulphonate as a ligand. Catalyst recovery is complete (E.P. 302,375, Feb. 1989, **Chem.Abstr.**, 1989, **111**, 56420).

Microemulsions for liquid-liquid (both organic) reactions

Rico, Lattes, Das and Lindman, have come out with a new strategy of bicontinuous phase where two immiscible organic liquids can be made to react. Amidation of 1,1,2 trihydroperfluoro-1-decene (C_8F_{17} CH=CH_2) with formamide was used as a test reaction; gamma radiolysis in a non-aqueous microemulsion was adopted and the surfactant was potassium 2,2,3,3 tetrahydroperfluorohexanol. The terminal amide, $C_8F_{17}CH_2CH_2$ $CONH_2$ in 40% yield was realised. (*J. Amer. Chem. Soc.*, 1989, **111**, 7266).

Colour Chemistry

Sensitising dyes in photography

G.Ficken has discussed this subject and has also referred to specialist dyes used in halography and infrared photography. Silver halides which are normally sensitive to light below wavelengths of about 500 nm, can be rendered sensitive to light of longer wavelengths by the addition of certian dyes. Benzothiazoles are used so are benzimidazole trimethincyanides. Quinoline based pseudocyanine is also important. Polymethine chains continue to be important.

Sensitisation of emulsions for the production of direct positives (as opposed to the production of negatives in conventional photographic emulsions) is an important field and a favoured dye for this purpose was an imidazo-quinoxaline derivative.

Recent developments using new heterocycles are covered (*Chem. Ind.*, 1989, 16 Oct., No.20, p.672-677).

Colorants: use in high technology

P. Gregory has discussed the use of colorants in reprographics and security. Inkjet and thermal printing are discussed. The potential use of organic colourants in infrared security devices are discussed (*ibid*, p. 679-683).

Kinetic resolution of racemic allylic cycloalkenols (RAC) through hydrogenation

Nippon Soda have claimed that hydrogenation of RAC with Rh complex (S) — or (R) — of a specified ligand allows reduction. An example of 2-cyclohexen-1-ol is given. (*Chem. Abstr.*, 1989, **111**, 153258).

Isomerisation of alpha isophorone (AIPH) to beta isomer

The beta IPH is required for perfumes and vitamin synthesis and can be made by isomerization of the commercial AIPH in the presence of Fe (III) acetylacetonate in a distillation column so that equilibrium restriction is overcome via removal of the beta isomer. (Huels-A.G. Ger.Offen. PE, 3,735,211, April 1989, *Chem.Abstr.*, *1989*, **111**, 173656).

2-Cyclohexyl ethanol

This is required for perfumery and can be made by hydrogenation of phenyl ethyl alcohol in the presence of Rh-Al_2O_3 catalyst (*Chem. Abstr.*, 1989, **111**, 173658).

NO_X/SO_2 removal

Haldor-Topsoe have developed new catalytic procedures for deNO_X/SO_2 from flue gases which do not produce any solid waste; sulphuric acid is the product. The flue gas is cooled to 200-250°C in a PTFE membrane filter (which can work upto 280°C) to cut down suspended matter to less than 1 mg/m^3. Selective catalytic reduction is done around 390°C to remove NO_X with ammonia injection. In the next stage SO_2 is converted to SO_3 at 410-420°C. A rotary heat exchanger of mild steel is used to cool gas above 250°C, which is above the dew point of sulphuric acid. A wet gas sulphuric acid tower is used which is basically a glass shell-and-tube heat exchanger, cool combustion air is used for cooling.

Treatment of organic toxic waste electrochemically

Initial work was done in nuclear industry to dissolve insoluble material in fuel. An electrochemical cell with a Pt mesh anode and a Pt foil cathode is used with a sintered glass separator. Nitric acid/$AgNO_3$ with Ag^+ to Ag^{2+} constitute the oxidising substances. A variety of 'stubborn' materials like PCB's and pesticides can be handled. (*Chem. Engr.*, Instn. Chem. Engrs, UK, 1989, August, No.463, p.28).

Loop reactors for liquid-liquid reactions

Loop reactors (LR) have become popular for a variety of gas-liquid reactions such as hydrogenations, chlorinations, phosgenations, etc. L-L LR have relevance for suspension polymerization of styrene, vinyl acetate etc. Tanaka et al. have studied flowing characteristics in a circulating LR.

The mean velocity was found to be proportional t the impeller speed. The appropriately flaired marine impeller was found to be more effective than the unflaired axial flow impeller. (*Chem. Eng. Res. Des* 1989, **67**, 423).

ryl propionaldehyde (AP) (eg. precursor for ibu- fen) through hydroformylation

peeker et al. have shown that Rh-phospholes and phosphan or bornadienes — catalysed hydroformy- on of vinylarenes give AP in good yields. This reac- occurs under mild conditions of pressure of about atm. and temperature around 40°C (*J. Org. Chem.*, 9, **54**, 5208).

Iydroxybenzaldehyde (HB) via Reimer-Tiemann T) reaction

has been claimed that the reaction of phenol with HCl_3 in an aqueous NaOH/KOH solution, in the esence of $HO(CH_2CH_2O)_nR$ (R=C1-4 alkyl; n=3 to), via p $[[R(COCH_2CH_2)_nO]_2CH]C_6H_4O^-$ gives rela- ely very high yields of 4HB as compared to the sit- ation when the polyol is not present. (*Chem. Abstr.*, 89, **111**, 73759).

arboxylation of substituted phenols in sulfolane to ve derivatives of salicyclic acid

litsubishi Petrochemical have claimed that sulfolane can successfully used as a solvent; alkali salt is formed situ and water is removed via azeotropic distillation ith toluene. Thus Na salt of 2,4 di *tert* butyl phenol hen reacted at 120-130°C and 8-9 atm CO_2 pressure ive 3,5-di *tert* butyl salicyclic acid. (*Chem. Abstr.*, 1989, 11, 173769).

paration of *m* and *p* diisopropyl benzene through eotropic distillation

. Berg has claimed that the close boiling binary mix- re under reference can be separated with acetophenone an entrainer for azeotropic distillation. The relative olatility goes up from 1.14 to 1.45. The azeotrope can solvent extracted with propylene glycol to give m- omer rich phase. (U.S. 4,836,896, June 1989, *Chem. bstr.*, 1989, **111**, 173728).

-Phenoxy phenol (PP)

hara Chem. Co. of Japan has claimed that phenol and -chlorophenol can be reacted to give PP, in the presence f oxine-Cu(II) as a catalyst. (*Chem.Abstr.*, 1989, **111**, 73741).

leavage of alkyl tertiary-alkyl ethers into tertiary lkenes and alcohols

rdolchemie have claimed that by contacting the ethers with a strong mineral acid contained in the bottom of a column apparatus the dimerization of the alkenes can be prevented and also dehydration of the alcohol. Thus TAME was cleaved to isoamylene and MeOH at 70°C. (EP 302,336, Feb.1989; *Chem. Abstr.* 1989, **111**, 136428).

Combined oxidation and dehydrogenation in a Pd membrane reactor

Itoh and Govind have reported a potentially useful membrane reactor where an endothermic reaction like dehydrogenation of 1-butene and an exothermic reaction like oxidation of hydrogen to water are combined. Pd is an excellent candidate as a catalyst for both reactions and also as a "hot" membrane. Complete conversion of butene to butadiene was realised. (*Ind. Eng. Chem. Res.*, 1989, **28**, 1554).

Bioaffinity separations using reversed micelle extraction (RME)

Woll, Hatton and Yarmush have reported significant enhancements in the efficiency of protein recovery using RM extractants if an affinity ligand surfactant is incorporated in micellar phase formulation. Model protein concanavalin-A was used and extraction increased dramatically on addition of small amounts of octyl-ß-D-glycopyranoside (2 to 10% of the surfactant concentration) to the organic RM phase. (*Biotechnology Progress*, 1989, **5**, 57).

Absorption of H_2S and MeSH on activated carbon: Role of ammonia

Granular Activated Carbon (GAC), impregnated with NaOH, is commonly used for the removal of H_2S and MeSH at ppm level. Turk et al., have shown that virgin AC, when used with a small side stream of ammonia enhances the capacity of GAC by a factor of 3 or more compared to NaOH activated carbon. The final product is sulfur and NH_3 acts as a catalyst. In the case of MeSH the corresponding increase in the capacity is by a factor of 3 to 6. (*Environ. Sci. Technol.*, **1989**, **23**, 1242).

Design of Sieve Trays

Barnicki and Davis have given a systematic procedure for the design of Sieve Trays. A comprehensive algorithm integrates tray design methods into a coherent hydrodynamic column-design procedure. (*Chem. Eng.*, 1989, October, p.140-146).

Surfactants: Important tools in chemical processing

Koulohens has given a good review of this subject. Examples include: use of surfactant for promoting wetting in heap leaching; deemulsifier in a copper extraction plant; Kraft pulping with recyle of used papers where deinking is necessary and a dispersant was used; a new foaming agent for making of gypsum board; dewatering agent in a coal filter cake. Criteria for selecting a surfactant is given. Many applications in textiles, paint, mineral processing, petroleum refinery, etc. are given. (*Chem. Eng.*, 1989, October, 130-136).

Ion Exchange Resins (IER) as catalysts in solid-solid-liquid reactions

Arrad and Sasson have shown that IER can act as "tri-phase catalysts" in some nucleophillic substitutions, base-catalysed alkylations, oxidation of secondary alcohols, etc. A variety of quaternized IER like Amberlyst A 27, Dowex lx2, Amberlite IRA 900 etc. were used. A typical reaction studied was benzyl chloride + sodium formate to give benzyl formate; other reactions were: $RBr + NaX = RX + NaBr$; $PhCH_2Cl + KCN = PhCH_2CN + KCl$; etc. In some cases 100% yields were realised. (*J. Org. Chem.*, 1989, **21**, 4993).

Phenolic composites

Norsolor's have introduced new varieties which can be used for various wet processing techniques — filament winding, pultrusion, continuous sheet production, etc. High-heat firesafe applications are guaranteeing 20% growth per annum. Phenolics are becoming popular for SMC, SRIM (Structural Reaction Injection Moulding), etc. (*Modern Plastics*, 1989, Sept., p.53).

Cationic Water Soluble Calixarenes as Catalysts

Shinkai et al. have used water-soluble cationic calixarenes as new host molecules to catalyse basic hydrolysis of 2,4 dinitrophenyl phosphate. 20 to 46 fold increase in the rate was observed. (*J. Chem. Soc., Perkin Trans. I*, 1989, 1859-1860).

Oxidations in aqueous-organic two phase system: Catalysis by metallo-tetraaryl porphyrins (MP)

Montanari et al., have carried out epoxidation of internal and alpha olefins in CH_2Cl_2 —water system with aq. 30% H_2O_2 as well OCl^- with MP as catalysts. This has potential for large-scale epoxidation. (*Pure & Appl. Chem.*, 1989, **61**, No.9, 1631-1636).

Zeolites for organic synthesis

Selective oligomerization of styrene

Yoon et al., have shown that Hydrogen Zeolite-Y, ambient temperature and methylene chloride as a so vent, allows selective dimerization (≃80%) of styrene the linear dimer 1,3-diphenyl-1-butene. Prolonged con tact even at ambient temperature allows the saturate cyclic dimer 1-methyl-3-phenyl indane to be forme quantitatively. Comparisons with soluble catalysts an other catalysts have been made. (*J. Molecular Catal sis*, 1989, **52**, 375).

Hydrolysis of 4-cyano pyridine

The efficiency of zeolites in converting 4-cyano pyr dine to isonicotinamide has been demonstrated by Mi achev et al. Hydrolytic hydrazinolysis of 4-cyano-pyr dine has also been demonstrated. Additional reactio referred to above are: Micellar catalysis, reactions microemulsions, etc. [Minacev et al in P.A. Jacobs a R.A.Vansanten (Editors): Zeolites: Facts, Figures, Futur 1989, Elsevier, p. 1088].

Cationic Ion Exchange Resins (CIER) as Catalys

Amberlyst-15 promoted synthesis of fused and spir gamma-butyrolactones from β-hydroxyesters

Bunce et al have brought out the superiority of IER ov the homogeneous catalysts in conducting the reactic under reference by using heptane as a solvent; refluxir conditions can be adopted as the temperature will n exceed 98°C. Fused-ring lactones are formed with th *cis*-geometry at the ring junction and the regiochemi try of the closure is that expected from a process pr ceeding through the most stabilized carbocation. The u of IER allows easier monitoring of the reaction, allow convenient work up and gives higher yields. Typical la tones made were (±)-dihydro-5-methyl-5-propyl-2 (3H furanone, (±)-dihydro-5,5-dimethyl-4-phenyl-2(3H furanone, etc. (*Synthetic Communications*, 1989, 1 2423).

Amberlyst-15 as a convenient catalyst for chemo elective thioacetalization

Perni has proposed a new, mild and chemoselective pr tection of aldehydes as 1,3-dithiolanes which works room temperature even in the presence of aldehydes. higher temperatures ketones can also be protected. In typical case benzaldehyde, in the pressence of acetop enone, was reacted with ethanedithiol, using chlorofor as a solvent to give selective thioacetalization. Yiel like 95% have been realised. (*ibid*, 1989, **19**, 2383

Nuclearisation of energy stressed

veloping countries round the world prepare for entrance to the nuclear or there can be no alternative to ar power as an energy source of ture, according to Dr. Hans Blix, tor General of the International ic Energy Agency (IAEA).

. Blix was in Bombay in connec- with a regional seminar on nuclear er attended by media personnel Pakistan, Bangladesh and Iran ng others. At a press conference in bay, he said the two factors that d impede the rapid growth of ear power plants round the world he cost in terms of hard cash needed et up such plants which are capital nsive and the resistance put up by ironmentalist groups.

However, there is no way in which ure (sun or wind) could become a ole alternative to nuclear energy, he l. Dr. Blix said nuclear energy is uti- d in more areas than generally vis- . Agriculture, industry, medicine, ilisers, and plant pathology are only ew. However, there is more media us on food and radiation, raising lms about the safety of nuclear ver generation. Criticising the role of ironmentalists in their opposition to lear power, Dr. Blix pointed out that ear power has a significant role to y in the reduction of greenhouse gases. He said that conservationists missed one important need for environment control, that of population reduction without which all conservationist attempts round the world could fail.

Replying to a query, he admitted that nuclearisation of energy sources by nations round the world has somewhat stagnated in the last several years. Currently there are 430 nuclear power reactors in the world and he expected these to go up to 500 by the year 2000. He hoped there would be a greater willingness on part of nations to go in for nuclear power.

Later, the Atomic Energy Commission Chairman, Dr. M.R. Srinivasan, said standardisation is the most important factor in reducing costs. Dr. Srinivasan said the country has already gone in for 14 nuclear power reactors and expected to go in for another 16 reactors of 500 megawatt capacity by the end of the century. Six of the 500 mw reactors had been cleared by the Government and clearance is awaited for six others. Reacting to queries about the incidences of cancer among people living within a certain radius of nuclear power reactors, Dr. Srinivasan said the agency's research along the Kerala coastline where it has an active project on-going has generated no evidence so far that there were more cancer deaths in Kerala than elsewhere. Later speaking to reporters informally he said at least three reactors will go critical in the next year.

GEB URGES CENTRE TO CHARGE LESS FOR GAS

Gujarat Electricity Board (GEB) Chairman Mr. Jashwant Mehta demanded that the Central Government charge a lower price from Gujarat for gas, an abundant natural resource in the State. Speaking to newsmen at Baroda, Mr. Mehta said that in spite of being one of the major areas in the country from where gas is recovered, a price of about Rs. 1,400 per 1000 cubic metres (cu m) gas is charged by the Centre from the State govt. As against this, the country's North Eastern States, also major gas sources are charged a lower price of Rs. 1,000 for 1000 cu m gas, he said.

Meanwhile, Mr. Jaswant Mehta said that he had forwarded his resignation letter to Chief Minister Mr. Madhavsinh Solanki. Addressing a press conference, Mr. Mehta said that he had taken this step 'to give a free hand to the new Chief Minister in making fresh appointments and to maintain the democratic traditions of Gujarat's public life'. Mr. Mehta had earlier been given an extension of two years as the Board Chairman.

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Chemical industry: white paper urged

The chemical engineering congress for the year-Chemcon 89 sponsored by the Indian Institute of Chemical Engineers in connection with the institute's 42nd annual session, commenced at Trivandrum on Dec. 15 with a call for a white paper on the chemical industry in the country, by the UB group chairman Mr. Vijay Mallya who inaugurated the four day session.

Mr. Mallya said that this was essential in order to redefine the role and direction of the chemical industry in the country. He urged the government to give due representation for chemical engineers in the policy making bodies so that professionals would have a say in decision making. The UB group chief said in his inaugural address that in regard to the chemical industry, there was a north-south divide. The industry in the south was still in its infant stage. This needed to be corrected.

Mr. Mallya expressed the view that indigenisation could have been speeded if proper attention was given to research and devlopment. He also felt that the government should create more facilities in the country that could help minimise the over dependance of the industry on imports. In his presidential address, the chairman of the Indian Institute of Chemical Engineers and chairman and managing director of Hindustan Latex Ltd., Dr. P.V.S. Namboodiripad stated that professionalism and professional bodies were yet to be properly recognised in the country. He pointed out that out of the 60,000 chemical engineers in the country, their institute had only around 5,000 on its rolls. Dr. Namboodiripad also called for a review of the various acts and rules that inhibited the growth of chemical industry in the country.

About 500 delegates attended the session. The delegates are drawn not only from all parts of the country but also from abroad. Countries represented at the session include Canada, Holland and the United States. Over 200 technical papers covering the entire spectrum of chemical engineering were presented during the technical sessions.

Among the key figures participating in Chemcon '89 were, Prof Oldshue, vice president, Mixing Equpt Company (USA) Dr. R. Kobayashi, Rice University (USA), Dr. C.A. Sastri, IIT, Madras, Dr. V.R. Gowarikar, secretary, Department of Science and Technology, Government of India, Prof. N.K. Bose, Calcutta University and Mr. M.R. Kurup, former director of Shar Centre. The annual session re-elected Dr. P.V.S. Namboodiripad as the chairman of Indian Institute of Chemical Engineers.

LUBRIZOL PAYS Rs. 86.4 LAKHS

The Petroleum and Chemicals Minister Mr. M.S. Gurupadaswamy, received a dividend cheque for Rs. 86.4 lakhs from Lubrizol India Ltd. Chairman, Mr. P.K. Rudra. The dividend has been paid at the rate of 15 per cent, an official release said. In 1988-89, the net profit earned by the company increased to Rs. 7.69 crores from Rs. 6.86 crores in the previous year. The company has been able to improve its performance by reducing the cost of inputs and keeping prices of its products "almost stable" since 1985 despite rise in the prices of the raw materials used by the public sector company, the release added.

KERALA SSIs MAY LOSE Rs. 10-CR. INVESTMENT SUBSIDY

The small-scale industries in Kerala stand to lose investment subsidy to the tune of Rs. 10 crores unless the amount is distributed by December 31 by the State Government, the Small Scale Industries Association has complained. The State Government is not bothered to release the subsidy so far in spite of having received a number of representations from the Association and the affected units. The association has suggested the Kerala Financial Corporation (KFC) disburse about Rs. 5.5 crores.

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ETTER TO THE EDITOR

Woes of Bagmari's acid industry

Bagmari area is located in north eastrn zone of Calcutta. This locality is ong known as an industrial area for manufacturing acids, alkalies, chemicals, soaps, paints and various other allied ancillaries. They are all S.S.I. units.

In the field of manufacturing acids and chemicals the undivided Bengal pioneered the industry during Swadeshi Movement when leadership came from leaders like the late Acharya Dr. P.C. Ray — the father of the Modern Indian Chemical Industries, Dr. Rasiklal Dutta, Dr. Nilratan Dhar, Dr. U.N. Bramhachari, Dr. Kartick Chandra Bose and Bhudeb Mukherjee.

In addition to several hundreds of small scale industries that grew up in Calcutta and its adjacent areas during this period; the Bagmari area practically developed due to easy availability of sulphuric acid and basic raw materials produced particularly by M/s. Bengal Chemicals & Pharmaceuticals Ltd. The entrepreneurs who started the acids and chemicals industries in Bagmari area got no help from Government.

Now there are about 90 units manufacturing acids and about ten thousand people directly or indirectly employed in this industry. The total sale value of acids, alkalies and chemicals produced here as estimated by one source is approximately to the tune of 10-12 crores. The peculiarity of these acid units is that they really do not produce acids but in fact they purify it adopting various methods and the quality of these purified acids are also acclaimed by various Government authorities.

But in purifying acids these small units use such back dated process equipments which are unthinkable in modern times. The entrepreneurs mainly hailing from middle class families cannot invest much from their own sources that the modernisation requires. They approached various state and central government bodies for modernisation but in vain.

During the post independence period these units did not grow to the extent which should be expected as compared to the other states of India, owing to lack of proper attention, initiative in the part of state and central governments in spite of easy availability of raw materials, land etc. One can not think of the conditions under which Bagmari acid units are situated in small sheds of brickwall and tiles. There are no sanitation facilities there, no tap water, no good drains, roads are not metalled, are filled with coal cinders, ashes, pot holes everywhere. In rainy season it becomes hell.

Despite this situation the acids produced here are good in quality and find their market everywhere in India. The main buyer of these purified acids and alkalies are educational institutions, laboratories etc. Since their offtake is very small the acids and alkalies were forwarded to their destination by parcel vans attached to passenger trains. For safe handling and easy identification of acids they are generally packed in special type pentop wooden cases as per railway rules. But from 1.8.1980 the Railway authorities stopped booking acids in parcel van leaving only goods train for acid booking.

Since acids are required by every nook and corner of the country by small colleges at small stations that are not covered by goods train booking. Though the goods train can be booked to any station if the weight of the consignment is minimum 9 MT but hardly any college requires such quantity. Thus the acid units of Bagmari found no other alternative but to stop sending acids to small destination because of Railway restriction. It is the tremendous blow hit under the belt of the acids units of Bagmari.

Acid and chemical manufacturers association has been continuously demanding to the State and Central Governments to declare the Bagmari Area as an Industrial Estate with a special emphasis to acids, alkalies and chemical industries and develop infrastructural facilities such as roads, water, electricity, banks, post office, testing centre, creches etc. But the government kept mum. So far ACMA also demanded withdrawal of Railway restriction for acid booking but in vain.

And because of this resultant negligence and lack of initiative by State and Central Governments the future of acid industries in Bagmari is bleak and diminishing though it has large employment potential at low capital investment. The industry has the technical manpower, raw materials are also available yet it is to die of utter negligence by Government authorities.

Signed
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Phones: 356322, 354356, 365296.

TECH. INSTITUTES TOLD TO MEET CHALLENGES

Dr. C.N.R. Rao, Director of the Indian Institute of Science, called upon technical and scientific institutions in the country to meet the challenges of the next decade. Delivering the tenth convocation address of the Jawaharlal Nehru Technological University (JNTU) at Hyderabad, Dr. Rao said that to sustain industrial growth and contain the probelms arising out of increase in population, India should be in a position to achieve an annual export rate of Rs. 100,000 crores worth goods and services from the current meagre few thousand crores. In order to achieve this huge volume of exports, the country's technical and scientific institutions should improve their calibre through excellence and attain self-sufficiency, he added.

Polymer makers cut supply to India

Leading global polymer producers including the Saudi Arabian Basic Industries Corporation (SABIC) have curtailed supplies to India following an upsurge in demand in the United States and Europe.

The sudden shortage and continuous uptrend in price has been caused by stoppage of production at Phillips Petroleum's 6.8 lakh tonne capacity high density polyethylene plant at Pasadena, Texas, the world's largest facility for this polymer. HDPE, which was quoted around US $720 a month ago, has now crossed the $1,000 mark.

The material is not freely available even at the high price. Leading global producers have either stopped booking or have drastically cut supplies. Phillips Petroleum, which boasts of a wide range of grades, is shipping material from its Singapore facility to feed its brand-loyal American consumers. Producers have no qualms about ditching Indian buyers who are never brand-loyal but invariably opt for the lowest priced material.

HDPE consumers in India, especially container manufacturers, largely depend on imports. Their production has gone out of gear ever since the current shortage began. The total demand for this polymer is estimated at close to two lakh tonnes, while indigenous availability is only 40,000 tonnes. The demand gap is traditionally met from imports from West Asia, Singapore, the Far East and Yugoslavia. Prices of other polymers like polypropylene, low density polyethylene and linear low density polyethylene, have all gone up in sympathy.

The Indian processor's import bonanza, with landed price being lower than prices charged by indigenous producers, has proved shortlived. Between May 1989 and September 1989, there was a crash in prices of HDPE and PP followed by PVC and LLDPE and processors heaved a sigh of relief because polymers again became affordable after the bad year of 1988-89. The explosion in the American plant changed all that and giant polymer producers are following a wait and watch game before making new price offers. In six weeks, they have increased price by a staggering 30-35 per cent in HDPE, 25-30 per cent in LLDPE and 20 per cent in PP.

In less than three months, processors are back queueing up before local producers for their percentage allocations. Local polymer producers are sold out and need to ration their products as imports have become costlier. As the global price warms up and supplies become thin, there will be an acute shortage in the coming few months, leading to underutilisation of processing capacities once again.

Given this situation, it will be most unfortunate if the Government makes any upward revision in import duties, processors have said. They say that the new Government must realise the vulnerability of thousands of small processors and give a time-bound target, with penalties for failure, to those licenced to commission polymer plants in the coming two to three years. Those who fail to implement their letters of intent within the stipulated time ought to be black-listed.

It is paradoxical that in many neighbouring countries, daily necessities like buckets and mugs cost less despite the fact that they have no naphtha or gas cracker or downstream units. This is because of the low level of duties in these countries. Against an average duty of 100 per cent ad valorem in India, the following are the duties charged in some neighbouring countries: Indonesia 15 per cent, Nepal 32 per cent, Sri Lanka 25 per cent, Pakistan 60 per cent, Bangladesh 65 per cent, the Phillipines 20 per cent and Malaysia 30 per cent.

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Godrej group to raise capital for first joint venture company to make alpha olefins

The Godrej group has formally veiled its plan to promote a joint ven-re company under the name and style Gujarat Godrej Innovative Chemicals d. to manufacture the synthetic deter-ent precursor, alpha olefin (the sulpho-ated form of which goes into the anufacture of detergents and soaps as pha olefin sulphonate). This is the first me that the hitherto closely held odrej group which has sales of s. 800 crores is permitting public nancial participation.

The new company which will be ocated in the backward district of Bharuch in Gujarat will be the first indigenous manufacturer of alpha olefin. Currently, the entire AO requirement of he domestic detergents industry aggregating 1000 tonnes and valued at Rs. 30 crores c.i.f. is imported. GGIC will produce 10,000 tonnes of AO, its derivaives and precursors at full capacity, about a third of which will be consumed by Godrej Soaps and the rest will be sold to other big users of detergents such as Hindustan Lever, Nirma etc.

A unique feature of the project is that it will use vegetable oil (imported palmolein) instead of natural gas or naphtha as feedstock. The basic technology to convert vegetable oil into AO was in fact developed by Dr. B.P. Godrej, patriach of the Godrej group. The process technology incorporating the Godrej conversion process has been developed by Lurgi GmbH, the well known German company which is a European leader in process technologies.

The company will need to import Rs. 20 crores worth of palmolein every year to manufacture 10,000 tonnes of AO, but since the total import of AO will also decrease after the company goes on stream, the net outgo of foreign exchange, according to company managers, will be negative. The project which will cost Rs. 109 crores to implement and is scheduled to go on stream in early 1991, is expected to operate at over 50 per cent capacity in the first full year of production. The project is to be financed as follows: equity capital of Rs. 21.80 crores, loans from the financial institutions of Rs. 43 crores and market mobilisations in the form of convertible and non-convertible debentures aggregating Rs. 43.60 crores. Of this sum, Rs. 31.50 crores will make up the convertible part (Rs. 150 face value which will be converted into two lots of five equity shares of Rs. 10 face value each at par, the balance Rs. 50 being unconvertible) and Rs. 12.10 crores will comprise the non-convertible portion. The Rs. 21.80 crore equity capital of the company will be divided between the Godrej group (39 per cent) the Gujarat Industrial Investment Corporation (11 per cent) and the public 50 per cent.

According to the company's newly appointed managing director, N.P. Godrej, (a post graduate of Stanford Univeristy and an MBA from Harvard) the project will make a cash profit at 35 per cent of capacity utilisation, given current prices of imported palmolein and the projected sale price of AO which is being pegged slightly above the landed price of imported AO which it will substitute. At full capacity, profits will be significant, says Godrej, and projects a net earning of Rs. 8 crores in the first full year of operation itself. Demand for AO will be no problem says Godrej, not withstanding the fact that the public sector IPCL is also scheduled to enter the AOS sector in a few years.

Comments Adi Godrej, Managing Director of Godrej Soaps, "Demand for detergents is growing at 20 per cent per annum and for soaps at 10 per cent. AOS, which is a derivative of AO is used in both toilet soaps and detergents, and as long as demand for the end product is growing rapidly, the demand for the inputs will grow too. Right now, the entire requirement of AO is imported,

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and two companies, Dharamsi Morarjee and Godrej convert the imported AO into AOS. IPCL has got the letter of intent to manufacture AOS, but it has still not even identified a technical collaborator. It will be years before they enter the market. In the meantime demand for AO would have exceeded the capacity we will be installing, and we may have to expand capacity at that stage".

The company proposes to price its product at Rs. 30 per kg, which is comparable to the price of linear alkyl benzene (LAB) at Rs. 27 per kg. Hence fears that AOS will be far too costly to find widespread use in India are misplaced says Adi Godrej.

Since AOS has stronger lathering action than LAB in hard and cold water, one part of AOS can replace two parts of LAB in standard detergent powders, so given that its price is only marginally higher than LAB, it is actually more economical.

An interesting feature of the AO manufactured by the Godrej process from palmolein is that it has a great predominance of 16 carbon atoms and 18 atom carbon chains, in contrast to the AO manufactured from petroleum sources which tend to predominate in 14 and 16 carbon chains. The longer 16 and 18 carbon chains have better lathering properties in hard water than the smaller chains. For Indian conditions, the Godrej AO is perhaps more appropriate than imported AO which is typically made from petroleum feedstocks.

SI VISCOSE TIES UP WITH AMERICAN FIRM FOR DRILLING FLUID MANUFACTURE

South India Viscose Ltd., Coimbatore, has launched a major foreign exchange saving venture by entering into a technical and financial tie-up with an American firm for the manufacture of a drilling fluid for oil explortaion in India.

It has set up a subsidiary, SIV-Magcobar Lignins Ltd., with an investment of Rs. 6 crores in equity. The foreign collaborator, Dressers Magcobar (M-1 Drilling Fluids) will take up 40 per cent of the equity, the remaining 60 per cent being provided by S.I. Viscose.

The project has been in the pipeline for the last seven years and has taken off only after establishing the minimum economic viability from the domestic, middle east and near far east markets.

The plant, coming up at Sirumugai where S.I. Viscose is located, will have an installed capacity of 12,000 tonnes of lignosulphonates per annum. Company sources said that beginning with a capacity of 6,000 tonnes, SIV-Magcobar Lignins will achieve the rated capacity at the commencement of the second year of operations. Fifty per cent of the output will meet the requirements of the ONGC, Oil India Ltd. and foreign oil companies operating in India and the balance will be exported to South East Asia.

The plant will incorporate the state-of-the-art technology and import of capital goods will be a mere half per cen of the total requirements. The raw material, calcium bisulphite solution commonly known as wood liquor, wil be entirely indigenous, being a by-product of S.I. Viscose's pulp plant.

The new plant proposes to manufacture four grades of oil field lignosulphonates and 20 types of industrial grad lignosulphonates which find applications in concrete mixes, refractorie birquetting, dyestuff, cement, foundr cattle feed and dry-cell batteries. A present, the country's entire requiremen of lignosulphonates is met by impor from America, Canada and Scandinavian countries. The company hopes t make its first physical export in Febru ary next year. Encouraged by th response from domestic and international customers, it is already plannin its second and third phase of expansio

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Kribhco urged to set up more plants

Delegates to the ninth annual general eeting of Krishak Bharati Co-perative Ltd. (Kribhco) held at New elhi on December 16, suggested the etting up of a DAP plant in north India nd a zinc sulphate plant by Kribhco so hat farmers' needs for these fertilisers ould be met adequately.

Opening of new area offices, more Krishak sewa kendras, under the single vindow concept, increasing the number f adopted villages and cluster villages nd strengthening the services to the armers were some of the other suggesions made at the meeting. Mr. J.V. Shah, a senior Kribhco director who resided, said Kribhco's urea and mmonia plants at Hazira continued to perate at a high performance level.

During 1989-90 (up to December 10, 1989), the plants produced about 11.46 akh tonnes of urea against the budget f 10.87 lakh tonnes. During the same ime, the ammonia plants produced 6.82 akh tonnes of ammonia against the targetted 6.60 lakh tonnes. A record production of 12.81 lakh tonnes of urea and 7.68 lakh tonnes of ammonia corresponding to average capacity utilisation f 117.7 per cent and 115 per cent espectively was achieved during the nine months ending March 1989.

The society's excellent performance n the fields of production, marketing nd management has resulted in a net rofit of over Rs. 85 crores during 988-89. This was noteworthy especially keeping in view that the new etention price formula notified by the ertiliser industry coordination committee implemented from April last year as adversely affected profitability of e fertiliser manufacturers, including Kribhco.

The Managing Director of Kribhco, Mr. K.K.S. Chauhan, said that the society was considering a proposal for setting up a joint venture phosphoric acid plant in Jordan at a cost of Rs. 300 crores.

WORKSHOP ON FIRE CONTROL MANAGEMENT

One day workshop on 'Fire Control Management' will be held on Friday 16th February 1990 at V.J.T.I. Auditorium. The workshop is organised jointly by Technical & Applied Chemistry Department, V.J.T.I. and Association of Safety & Health Professionals, Bombay 400 080.

The said workshop will be inaugurated by Dr. K.H. Gharda, Managing Director, Gharda Chemicals (P) Ltd., and the key-note address will be by Mr. N.K. Srivastava, General Manager, Hindustan Petroleum Corporation Ltd., and Mr. S.T. Raman, Chief Vigilance and Security Officer (MSRTC) and Fire Adviser to Government of Maharashtra.

The workshop is organised to meet the challenges faced by Fire Control Management in industries like refineries, textiles, paints, chemicals, plastics, engineering etc.

Registration fee charged will be Rs. 250 per participant. For details please contact Dr. K.H. Sadri, V.J.T.I., Matunga, Bombay 400 019.

J.K. SYNTHETICS

J.K. Synthetics Ltd. has suffered a set back in its working during the six months ended September 30, 1989. Despite modest increase in net sales at Rs. 288.50 crores (Rs. 254.80 crores), the company has earned a lower gross profit of Rs. 27.20 crores as compared to Rs. 33.30 crores in the same period last year. After providing Rs. 22.70 crores (Rs. 22.50 crores) for depreciation and Rs. nil (Rs. 1.10 crores) for taxation, the net profit works out lower at Rs. 4.50 crores as compared to Rs. 9.70 crores.

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Wimco to sell anode business

WIMCO Ltd. has signed an agreement to sell its business of manufacturing titanium coated metal anodes to a newly established company, Titanor Components Ltd. Titanor Components Ltd. plans to enter the capital market shortly and thereafter list its shares on stock exchanges in India.

The titanium coated metal anodes business was established by WIMCO in 1983 to service the chloralkali industry and to supply world class metal anodes for reducing power consumption of caustic soda plants, and also to curtail down time in maintenance of the plants. In 1984, WIMCO became the market leader in India for supply of the metal anodes to the caustic soda industry and this diversification contributed to WIMCO's profits and cash flows.

With a down-turn in the caustic soda industry during 1986 to 1988 and due to Government insistence that expansions of new caustic soda plants should be based upon ion exchange membrane technology only, the demand for conventional metal anodes tapered off. The changed business scene resulted in lower level of manufacturing and the metal anodes operations became less profitable.

To concentrate resources on its main business lines, WIMCO decided to divest its metal anodes manufacturing business.

Titanor Components Ltd., which will be acquiring the metal anodes business from WIMCO has been established in collaboration with the De Nora group of Italy. 'De Nora' is an international major in technology as well as manufacture of anodes and cathodes for the chloralkali industry. De Nora will accelerate supply of knowhow and technology for servicing the chloralkali plants in India based upon ion exchange membrane technology and will provide
able technical, operational and
agement support to Titanor Compo
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L & T PROPOSAL FOR ASPH PROJECT REJECTED

Larsen and Toubro's proposal
up a Rs. 14.4-crore joint venture
Coals S.A. of France to manufa
asphalt emulsions, an advanced
construction material, has been
down, it is learnt. The rejection
based on the objections raised b
refineries who will have to suppl
raw material viz. bitumen, requir
produce asphalt emulsions.

The refineries say that bitumen
their product, it made more sen
produce asphalt resins themselves
value-added by-product instea
allowing a private sector compa
produce it. As per the L & T prop
the main plant was to be locat
Maharashtra and "other plants w
be moved from place to place de
ing upon road construction activi

It has planned to issue equities
Rs. 480 lakhs and raise term
worth Rs. 960 lakhs for the projec
turnover was expected to be Rs.
lakhs. L & T had made the pro
with its then subsidiary Engine
Construction Corporation (ECC)
major consumer of the product.
ever, ECC later merged with L

NEW KNOWHOW TO PROD DIAMOND

Diamonds can be produced by
a laser beam, according to Sovie
entists. Scientists of the Instit
Chemical Physics under the
Academy of Sciences, have foun
diamond powder can be obtai
passing ordinary soot through
beam and then cooling it. The p
will produce mixture of carbon p
consisting of the minutest parti
diamonds and graphite. They ar
separated by an electric dischar

x petrochem units in Cochin planned

petrochemical units with a total nent of Rs. 385 crores and an yment potential of 1200 are likely ne up in the Cochin area within xt five years.

Kerala Government is hopeful of g an investment of Rs. 250 crores Hindustan Organic Chemicals Ltd) itself in this area. HOC has ly an investment of Rs. 100 crores chin.

C in consultation with the Kerala Industrial Development Corporation (KSIDC) has identified six projects nplementation during the next five . They are: trimer/tetramer, p-ne (PTA), picoline, oxoalcohols, nenol and nitrobenzene.

ccording to State Government sour-HOC has indicated its willingness art on its own the first four units, ect to the approval of the Union ernment.

OC has already finalised for ementation directly by itself a 15-crore project for the manufacture imer/tetramer with an annual capa- of 10,000 tonnes. This will come the present plant area of HOC in hin. Benzene and propylene, the material required for this project are ily available. The products of the osed factory are used in detergent stry.

he second project, PTA is based on availability of paraxylene from aromatic expansion project of hin Refineries Ltd. The capacity osed is two lakh tonnes per annum the project involves an investment s. 250 crores. The product of this is used for polyester fibre. This pro- will take three years for completion. investment required will be met by C and the Union Government.

ut this project is in the nebulous e. The letter of intent has to be obtained from the Centre. The State Government is approaching the Centre for this as well as for the investment clearance.

The other two projects identified by HOC for investment are picoline 6000 tonnes and oxoalcohol 15,000 tonnes per annum with an investment of Rs. 30 crores each. Details are being worked out.

KSIDC, which has already obtained a letter of intent, has signed a memorandum of understanding with a private party to set up a Rs. 30-crore project for the manufacture of bisphenol. The letter of intent in hand is only for 3000 tonnes. To make it more viable, KSIDC is advised to get the letter of intent raised to 15,000 tonnes.

Nitrobenzene/aniline is another project proposed. This will have a capacity of 11,000/6000 tonnes per annum and the investment required will be Rs. 30 crores. HOC will provide the technology. The raw materials required, namely, sulphuric acid, will be available from the neighbouring FACT and benzene from Cochin Refinery. Nitric acid can be produced by this unit itself. KSIDC will apply for a letter of intent immediately.

A high-level meeting on December 15, presided over by the Industries Minister Mrs. K.R. Gowri, and attended by Mr. K.P.K. Nambiar, adviser to the Kerala Government. Mr. Mohanachandran, Commissioner and Secretary, Industries Department. Mr. M.K. Ravindranathan, Managing Director, KSIDC, Mr. Chudamani, Technical Director, HOC, and Mr. Jayaprakash, Chief Engineer, HOC, Cochin, reviewed the progress of the above projects and it was decided that the State Government, KSIDC and HOC would take actions required at their levels for the speedy implementation.

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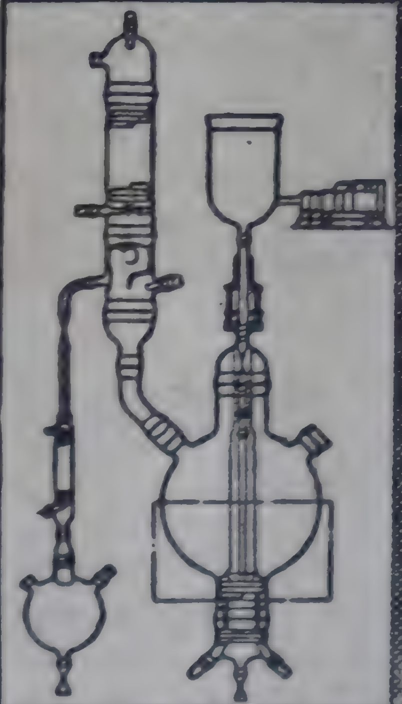

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New gas find in Kutch offshore

A significant gas find has been made at GK 29A prospect in Kutch offshore located about 100 km southwest of Bhuj in Gujarat.

An Oil and Natural Gas Commission (ONGC) note said that the well, GK 29-A-1, has produced gas at the rate of 124,330 cubic metres per day. Further testing was in progress.

The Kutch offshore basin was considered to be highly prospective with hydrocarbon resources to the tune of 380 million tonnes of oil and oil equivalent of gas. ONGC proposed to intensify exploration in the area by adding one more rig in early 1990s, the note said.

Giving details of the offshore scenario in the 1990s, the note said the outlook was very bright. The current production of oil at 22 million tonnes per annum and gas at 14 billion cubic metres would exceed 31 million tonnes and 20 billion cubic metres per annum by mid-1990s and increase to 40 million tonnes and 27 billion cubic metres per annum by the end of century.

In the Eighth Plan, a production build-up of close to nine million tonnes was expected from the eastern and western offshore. The entire increase of about seven million tonnes from western offshore would come from fields other than Bombay High. As a result, the share of Bombay High to the total production from western offshore would reduce from 57 per cent in 1990-91 to 40 per cent in 1994-95.

A plan for production of oil from the fractured basement rocks of western offshore had been drawn up by ONGC. The oil production from the fractured basement was expected to be about 0.75 to one million tonnes per annum by the middle of the Plan (1992-93).

The note said the technologies in the 90s would include exploration in deeper offshore waters, production from unconventional reservoirs like the fractured basement, extended use of template, horizontal drilling, enhanced oil recovery methods and increased automation of production facilities.

The continental shelf of India, covering an area of about 380,000 sq.km. (up to 200 metres isobath) has been an area of intense exploratory activity for over a decade-and-a-half. Thirtyeight new discoveries have been made in western and eastern offshore since 1980.

The exploratory activity in the entire continental shelf has established inplace geological reserves of oil and gas of 2.4 billion tonnes of 865 billion cubic metres of gas.

MORE GAS EXTRACTION FROM TRIPURA PLANNED

The Oil and Natural Gas Commission (ONGC) is planning to extract 2.43 million cubic metres of natural gas per day in Tripura, within two years and increase it nearly two-and-a-half times by 1995. The ONGC General Manager for Tripura, Mr. J. Swaroop, said, that the commission would make available sufficient quantities of natural gas for rapid industrial development of the State since its capacity was largely underutilised at this stage.

He said only 65,000 cubic metres of natural gas were being utilised for gas-based units in Tripura.

He hoped the State Government would promote new industrial ventures like fertiliser plants, power plants and other units. This would increase consumption of 1.5 million cubic metres of natural gas per day. Mr. Swaroop said, though ONGC was yet to strike oil in Tripura, it was hopeful of its availability in the Harrarganj area in North district where investigation was continuing.

He said ONGC plans to hire thre rigs for drilling nearly 4000 metres i the area. It has already covered mor than half the targeted level. "May be w need not have to go that deep to fin oil", he said. Mr. Swaroop said, ONG had earmarked 32 development point in the State for surveys next year.

He agreed that ONGC would hav surplus gas after meeting Tripura' requirements. The organisation migh consider transporting 'surplus' gas outside the State by pipeline. Mr. Swaroo said ONGC was considering transporting surplus natural gas from Tripura t West Bengal.

Replying to a question, he said th commission now had the ability t extract over three million cubic metre of gas. Meanwhile, a new compan called the Purbanchal Gas Company was formed on December 7 to transpo and distribute natural gas joinly with th Tripura Industrial Development Corporation and the Assam Gas Company.

DEEPAK NITRITE

Deepak Nitrite has fared well durin the half-year ended September 198 Sales for the period touched Rs. 17.8 crores from Rs. 11.44 crores, whic includes a production stoppage of ove 40 days.

The gross profit has risen t Rs. 262.95 lakhs from Rs. 139.65 lakh while the net profit has jumped t Rs. 146.16 lakhs from Rs. 45.33 lakh after providing Rs. 67.79 lakh (Rs.69.82 lakhs) for depreciation an Rs. 49 lakhs (Rs. 24.50 lakhs) for taxation.

Meanwhile, the company is goin ahead with the implementation of Rs. 52 crores diversification programm at the existing site at Nandesari f which all clearances have been receive It proposes to produce under this programme 12,000 tonnes of nitro aromatics annually.

NGC likely to get more contracts abroad

ndia is likely to bag more contracts the petroleum sector in Vietnam, zania, Thailand, Malaysia and Abu abi in the next few months, official rces said.

The Oil and Natural Gas Commission NGC) is now negotiating with Pet- ietnam for taking up exploration con- cts in Vietnam, outside the blocks rrently under production-sharing reement with the ONGC.

The state oil company of Vietnam has pressed desire to award projects con- erned with the study of the "Red River asin" and also training their person- el in monitoring of production-sharing ontracts for wider execution in Viet- am.

The study of the Red River Basin, the ources said, would cover evaluation of e basin for hydrocarbon prospects at e basin studies division of the Insti- ute of Petroleum Exploration of the NGC at Dehra Dun.

The institute had earlier carried out imilar jobs for other countries. Based n the results of this study the develop- ent of the basin would be taken by etrovietnam on a priority basis.

Petrovietnam has also expressed its nterest in training its personnel in mon- toring the production-sharing contracts, NGC sources said.

The company has signed a series of roduction-sharing contracts with sev- ral multinational oil companies for oil nd gas exploration in offshore Viet- am. It has felt the need for trained per- onnel to monitor the contracts.

ONGC has constituted a special group Exploration Contract Monitoring Group (EXCOM) to monitor the roduction-sharing contracts signed by he government with various multina- ionals for exploration of hydrocarbons in the continental shelf of India. Petrovietnam is understood to have been impressed with the working of this group and has requested ONGC to train its group.

ONGC has signed a production-sharing contract with the Petrovietnam in May 1988 for exploration and production of hydrocarbons in block six, 12 and 19 of Vietnam offshore.

The ONGC already has a consultancy project in Thailand and is exploring possibilities of further cooperation with the Petroleum Authority of Thailand Exploration and Production company (PTTEP). A team headed by PTTEP Vice-President is scheduled to visit ONGC's institutes and Hazira Gas Complex.

The ONGC is also likely to reach a production-sharing contract with the Tanzania Petroleum Development Corporation. Details of the agreement have been finalised, sources said.

The areas under study in Tanzania are the coastal basins and Penba and Raswinde areas. Sources said its decision to take up exploratory ventures abroad was in line with such strategies followed by other international companies.

In addition to providing an opportunity of gaining access to outside oil, it helps in spreading of risks which is so essential in the oil exploration business.

The Commission acquired participation interest from AGIP of Italy for oil exploration and production sharing contract for block SK-9 in offshore Sarawak in Malaysia. It is also bagged consultancy agreements from Malaysian oil company, Petronas.

In addition, ONGC has commenced exploratory gravity magnetic surveys in the foothills of Bhutan for a three-year project worth over Rupees two crores.

ONGC is also negotiating with Abu Dhabi National Oil Company for further consultancy proposals. A senior team headed by its managing director is visiting India in January to discuss the proposals.

The company has already bagged a $1.43 million consultancy project called 'Stratigraphy and hydrocarbon potential of Jurassic sequence of Abu Dhabi'.

WAHI REPLACED BY P.K. CHANDRA

Col. S. P. Wahi handed over charge as chairman, Oil and Natural Gas Commission (ONGC) to Mr. P.K. Chandra, vice-chairman, ONGC. The charge was handed over at Dehradun, headquarters of ONGC following government's orders. Col. Wahi's extended term as chairman ONGC had expired in the first week of November this year but at the last minute was asked to continue until further orders.

Col. Wahi thus becomes the first chief executive in a public sector undertaking to be asked to quit after the new government has taken over.

Mr. M. K. Bagai, chairman and managing director, Hindustan Petroleum Corporation Limited (HPCL), has also been asked to hand over charge to another director of the company at the expiry of his term. The previous government was considering a proposal to extend his term by two years.

SHELLAC INDUSTRY EXPECTS TO LOOK UP

The Shellac industry is expecting a fair deal from the new Government. The Shellac Export Promotion Council Chairman, Mr. Samar Sinh Jaiswal at the annual general meeting of the council said that the existing export policy was a break from a mistakes of the past. The imposition of a monopoly agency in export of procurement of raw materials should not be brought into play by the present Government.

HALDIA PETROCHEM PROJECT:

Private sector keen on downstream units

The Ambanis, Mr. Viren J. Shah and a number of industalists have shown interest in setting up joint sector projects in the downstream of Haldia petrochemicals. The promoters of the other naphtha cracker plant — WBIDC and the RPG enterprise — remain unchanged.

Indicating this at Calcutta, Dr. Asim Dasgupta, the state finance minister said that the "benefits and costs" of the new proposals were being "carefully weighed" and decisions would be taken only after the government was satisfied that they would be good for the state. Nothing could be finalised without the Centre's approval, he added.

There were many rounds of discussions at Writers' Buildings between the chief minister, Mr. Jyoti Basu, Dr. Dasgupta, Mr. R. P. Goenka, Mr. Sanjiv Goenka, Mr. Mukesh Ambani, Mr. Viren Shah, former IPCL chairman, Mr. Subroto Ganguly, chief secretary, Mr. T. C. Dutt and other senior officials on the Haldia project. Mr. Goenka and Mr. Ambani first held separate meetings with Dr. Dasgupta. According to Dr. Dasgupta, the talks were satisfactory and that there should be no problem in both of them participating in the project.

The state government was of the opinion that industrialists were becoming more and more interested to set up units in the state in view of the changed political situation at the Centre. Dr. Dasgupta thought that it was an encouraging development that the government was listening to the proposals of industrialists.

Dr. Dasgupta said that the exercise to identify new entrepreneurs for the Haldia project had been initiated because of the increased project co which had touched Rs. 3,000 crore The naphtha cracker and the dow stream units are parts of one big proje and the state government would n agree to its break up.

The state government also held discussions with the IDBI chairma Mr. S. S. Nadkarni on Haldia and othe projects of the State. Dr. Dasgupta sai the discussions were of a "preliminar nature". He said that the state wa making a compendium of project which would seek IDBI assistance an the Centre's clearances. Mr. Basu i expected to leave for Delhi shortly t hold discussions on the finalisation o the projects.

Later, Mr. Mukesh Ambani said th he was not averse to the idea of partnering other industralist is setting up th Haldia project. However, everything i in a preliminary stage and it would tak some more time to finalise matters Mr. R.P. Goenka, refused to make an comment on the development. Whe asked as to whether he still stood by hi earlier statements about his desire to se the Haldia project come up for the benefit of the state and the country, M Goenka was about to make a reply whe his younger son Mr.Sanjiv Goenk intervened to say that any comment o Haldia petrochemical will be only fro Dr. Dasgupta.

IDBI's stand

While Industrial Development Ban of India (IDBI) is not much bothere about who are going to be co-partner of West Bengal Industrial Developmen Corporation (WBIDC) for the propose Haldia petrochemical project, it will certainly satisfy itself first about the management structure of Haldi Petrochemicals Limited, the compan which is to undertake the venture, an composition of the company's boar according to highly-placed sources i the Union government.

This is because, as the source

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in, IDBI will be required to shell very large sum of money for the ct. Assuming a 3:1 debt-equity for the Rs. 2800 crore project, the tutional finance is estimated to be Rs. 2,000 crores, including a for- exchange component of about 600 crores to Rs. 650 crores.

ince Haldia Petrochemicals will be I's largest exposure to any single ject, the sources add that the finan- institution will be required to obtain arance from the Union Government funding, more so to finalise the sour- g of foreign exchange.

As the funds will be needed over a riod of four years, it is likely that BI will consider the possibility of sing part of the resources by issuing nds.

Haldia Petrochemicals submitted the heme for product-mix for downstream ojects to IDBI recently. Prima facie e mix, according to the sources, pears to be alright. However, there is feeling that the choice of MEG nono-ethylene glycol) might have to e reconsidered as there is a chance of vercapacity of the product by the time e Haldia project goes on stream. A earer picture will be available only ter the committee of experts has gone to it in details.

Justifying the state government's lks with Mr. Mukesh Ambani cently, a senior CPI(M) secretariat ader said that the state was interested attracting investments bothered about e antecedents of any entrepreneur, we nly want his sincerity in implementing he project, he added.

The CPI(M) leadership also stated hat BJP's opposition to the talks with he Ambanis only exhibited their ill-will towards the state's development. 'We will counter their mischievous propaganda politically", he added.

The sources further informed that they have come to know of attempts being made by the authorities to locate a foreign collaborator who will be prepared to offer terms better than those quoted by Linde of West germany, which was earlier chosen to partner the project.

Meanwhile, according to knowledgeable quarters, Mr. Dhirubhai Ambani had met the West Bengal Chief Minister, Mr. Jyoti Basu, in New Delhi about two months back and the meeting indeed marked the beginning of an exercise on possible participation of the Ambanis in the venture as one of the co-promoters.

The position taken by Mr. Ambani was that his group would consider joining hands with the West Bengal government if Mr. Basu so desired. One interpretation of these quarters is that Mr. Basu was, perhaps, confident of securing the Centre's okay if the West Bengal government finally needed the Ambanis as co-promoters in addition to the RPG group.

It is further gathered that Mr. Gopi Arora, finance secretary, in his note prepared after Mr. Basu's meeting on June 23, 1989, with the then Union finance minister, Mr. S.B. Chavan, had emphasised the need for making sound financial tie-ups before starting work on the venture.

AMAR DYE-CHEM

Amar Dye-Chem has booked a single largest order worth Rs. 4.5 crores for one of its products with USSR and is negotiating further larger orders. It has also planned to increase its product range and looking to the overall boom in the dyestuffs/chemical industry.

The overall sales of the company during the six months period ended, have increased by 40 percent from Rs. 13.83 crores to Rs. 19.82 crores.

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Cartel pricing in drilling chemical sales to ONGC

A preliminary investigation report of the Monopolies and Restrictive Trade Practices Commission (MRTPC) has established the practice of cartel pricing and price manipulation by Cellulose Products of India Ltd. and Gujchem Distillers in the supply of carboxy methyl cellulose (CMC), a drilling chemical, to Oil and Natural Gas Commission.

The Commission has outlined the following suggestions emerging from its investigations. It will be appropriate to ask the Bureau of Industrial Costs and Prices to fix a fair price for the chemical. This is necessary because all CMC producers have said that the prices they get from ONGC are uneconomical. ONGC officials, however, feel that manufacturers enjoy a profit margin of 40-60 per cent.

Secondly, all CMC producers may be asked to enter into rate contract with DGS and D for supply of the chemical for a minimum period of two years. The suppliers should, however, meet the ONGC specifications. The present system of registration with Oil India Ltd. and DGS and D for the monetary limits with a view to avoiding the payment of earnest deposit with each tender bid may be abolished and each party asked to pay the deposit with each bid.

The MRTPC enquiry followed complaints from Kalpana Chemicals Private Ltd. of Hyderabad, alleging that the two accused units were indulging in predatory pricing in their quotations to ONGC. As against a total capacity of about 15,600 tonnes per annum, the licensed and installed capacities of Cellulose Products and Gujchem are 5,400 tonnes and 3,800 tonnes, respectively. As such, the two units may be called dominant undertakings the complainant had said.

The investigation also surfaced the questionable practices followed by ONGC in its purchases. The Corporation had not placed order for supply of CMC through tenders on the complainant till 1985-86, even though they had been bidding lower than the price quoted by the dominant undertakings. During the year, ONGC, at the instance of its then chairman, placed an order for 100 tonnes on the complainant at Rs. 18,000 per tonne as against Rs. 22,050 per tonne given to Cellulose Products and Gujchem.

In subsequent purchases, samples of other companies except Cellulose Products and Gujchem were "fraudulently" rejected by ONGC. The rejected parties took the matter to the Gujarat High Court which ruled that the decision of the two accused in lowering their bids to Rs. 14,500 per tonne was unjust, and directed that the orders be distributed among all producers.

When fresh tenders were called for in 1988, the two dominant units managed to get samples of the complainant rejected by illegally opening the technical tenders. Later, when the two found that they could not eliminate the complainant on technical grounds, they slashed the price from Rs. 22,500 to Rs. 14,500.

PETROCHEM PROJECTS MAY CHANGE HANDS

The ownership of some of petrochemical projects, which were partially cleared by the previous government, may change hands. One view in the new government is that up and coming entrepreneurs with requisite resources and expertise may be given an opportunity to set up such projects. Concentration in the hands of a few well known groups may be avoided.

Downstream units based on the Auriya gas cracker could fall in this category. The previous governmen issued a letter of intent to the p sector Gas Authority of India Li (GAIL) for this gas cracker approval by the Cabinet Committ Economic Affairs (CCEA).

No final decision was, how taken on the downstream units bas this gas cracker. Though the Pr Approval Board (PAB) cleared sharing of the downstream units 50:50 basis between GAIL and Birla group, the CCEA was yet to its approval when the previous gov ment went out.

The same is the case with the Petrochemical Complex which is b on naphtha. The CCEA had appr the UB group's proposal to set u cracker. However, no decision o downstream units was taken.

There is also the case of the H petrochemicals project. This proje to be based on naphtha and is prop to be set up as a joint venture bet the West Bengal government and R.P. Goenka group. Latest rep however, suggest that the West Be government is trying to rope in Ambanis as a third partner in the ject. How the Central governmen react to the proposal is yet to be

---

HERDILLIA CHEMICALS

Herdillia Chemicals Ltd. has rep improved results for the six mo ended September 30, 1989. Sales increased to Rs. 47.02 crores Rs. 43.25 crores in the same period year and gross profit to Rs. 8.19 cr (Rs. 7.93 crores).

After making necessary provis the net profit works out fraction better at Rs. 4.22 crores (4.06 cr According to the company, improved results for the period u review could have been better but rising costs of raw materials like zene and cumene.

OCHEM PROJECTS

Government will take second look

Government of India will be
a fresh look at all pending petrol-
nd petrochemical projects, the
Minister for Petroleum and
icals, Mr. M.S. Gurupadaswamy
ted at Bangalore recently. He said
committee of very senior officials
been appointed to go into all
ts, including the funding. Reply-
a query about the present status
he Mangalore refinery-cum-
chemicals project, the minister
"As far as my government is con-
ed, nothing has been finalised,
s are still in a proposal stage which
o be thoroughly vetted. Both the ca-
t and the Prime Minister have to be
inced about the economic feasibi-
nd rationale of all projects, whether
Mangalore or Karnal. The fact that
e private sector companies have
ounced their collaborations in these
ures should not be taken to mean
that the proposals have been approved *in toto* irrespective of whether it is Mangalore, Karnal, Hazira, Vizag or Auriya. The committee of senior officials will have to vet all proposals before any final decision can be taken by the government. This is what I have communicated to all interested parties who have met me, including Mr. Vijay Mallya".

At the same time, Mr. Gurupadaswamy said that he was aware that the process of acquiring land for the Mangalore refinery-cum-petrochemicals project had been initiated by the state government. "The process can go on and I will be meeting the chief minister shortly for further discussions", he said. The minister said that there was an acute shortage of crude, with the gap between supply and demand rapidly increasing. "It is ironical that, while petroleum products are being imported, we are burning up Rs. 500 crores worth of gas every year. I have also asked my officials to make better use of this gas. Only a day ago, gas was struck in the Cutch area", he added.

Asked about the possibility of setting up a southern gas grid with surplus gas being piped from South Bassein or Bombay High, Mr. Gurupadaswamy noted that gas was also available in the Krishna and Cauvery basins. "What I would like to see in the long run is a national network where petroleum and petroleum products can be piped", he added. Asked to react to a newspaper report that Snam Progetti had been dropped from the international consortium bidding for IOC's Kandla-Bhatinda pipeline contract and the remark by the Italian company's Delhi representative Mr. Ottavio Quattrochi and that the Petroleum Ministry could comment on this, the minister said, "may be somebody lower down (in the ministry) is aware of this".

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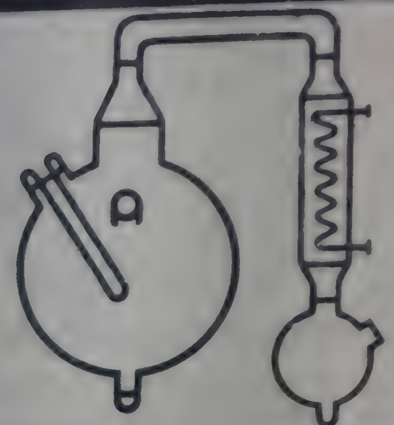

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TOPNAGS

POTLIGHT ON

Biotechnology and Life Sciences (Part 2)

ESEARCH UNDER PROGRESS O DEVELOP PROTECTIVE NZYMES AGAINST TOXINS ND PESTICIDES

esticides

Researchers at Texas A & M and the Univ of Guelph (Guelph O N) report hey have discovered an enzyme produced by bacteria common in soil that breaks down the toxins in some chemical weapons and pesticides by attacking certain chemical bonds.

When the genetic code for the enzyme was transferred from the bacteria to a group embryonic fruit flies, researchers report the resulting insects had as much as 20-times greater pesticide resistance than ordinary adult flies. The research goal is to allow beneficial insects to be more resistant to pesticides and to develop treatments to accelerate the breakdown of pesticides in the environment.

The US Army is also supporting the investigation, in hopes of developing a method to control the effects of chemical weapons, especially naurotoxins. The researchers maintain that extreme care is being taken to prevent the transfer of the enzyme code to wild populations. (*Chem Week.*, 9/27/89, p. 120)

AGRICULTURAL BIOTECHNOLOGY IN USA-AN UPDATE

The US agriculture is banking on biotechnology for maintaining its world leadership and future growth. Although products currently under development in the agricultural sector will offer real benefits to both farmers and consumers, some are sure to generate heated controversy. Realizing the potential for misunderstanding, many companies are undertaking or planning substantial consumer education efforts to counter unwarranted fears.

Sales of biotech products in the agricultural segment will be approximately $50 million in 1989, and products currently on the market include biopesticides, such as Bacillus thuringiensis-based pesticides for the Colorado potato beetle, animal health care products, such as scours and pseudorabies vaccines and diagnostics.

Further, commercialization may not be too far off for many of the more important potential agricultural products, such as genetically engineered crops for which a number of field trials are already under way. Monsanto is field-testing genetically engineered cotton that is resistant to tobacco bollworms. Joint field trials-are planned by Calgene and Monsanto of genetically engineered virus-resistance potato plants.

Pesticide and herbicide-resistant tobacco plants and insect-resistant tomato plants have also been tested and could come to market in the 1990s. (*Chem Week.*, 9/27/89, p. 31-32).

AMERICAN BIOTECH FIRMS CRITICIZE DRAFT RULES OF EPA ON MICROORGANISMS

EPA (USA) should not regulate genetically engineered microorganisms as the basis of their use and should regulate naturally occurring microorganisms, says the Association of Biotechnology companies (ABC) in its comments on the Agency's draft regulations on biotechnology products under the Toxic Substances Control Act.

The trade associations which represent more than 230 biotech firms oppose the EPA proposals to require premanufacture notification and review for each new use of a microorganism, stating that microorganisms could end up being held to higher standards of safety than that which exists for other chemicals. ABC also argues that naturally occuring microorganisms have been used commercially for centuries and EPA should not regulate them now without showing that the risks of their use outweight the benefits. (*C & EN*, 6/6/89, p. 11)

PHOTOTACTIC ALGAE PROVES USEFUL IN BASIC RESEARCH ON VISION

Phototatic algae, which move in response to light contain photoreceptor pigments that behave in many ways like the rhodopsin present in higher vision systems. Rhodopsin consists of the protein opsin and the polyene cis-retinal. When exposed to light, cis-retinal isomerizes to trans-retinal, a reaction that initiates changes in rhodopsin. These changes culminate in nerve impulses perceived as light.

'Blind' mutant strains of the algae that lack retinae also lack phototactic ability. Photoxis can be restored, however, by incubation with retinal analogues. Although bovine and algal rhodopsin systems have been thought to be similar both in mechanism of action genomically, these studies indicate that the alga receptor is not activated by a cis/trans isomerization of a polyene system. The prokaryotic mechanism should be of great aid in the development of artificial light sensitive systems, for activating retinal analogues which are much simpler in structure than those found in eukaryotes. (*1. Foster K. et. al. J. Am. Chem Soc.*, (1988), 110, 6589). 2. *Chemtech* 4/1989 p. 197).

A NEW BIOBLEACHING PROCESS FOR PAPER MILLS EFFLUENT

A new biobleaching process which uses a white rot fungus P. Larerochaete chrysosporium to reduce in the untreated effluent of a paper mill at Ahmedgarh in India, was presented by Prof. John F. Kennedy of Birmingham University at the Cellucon '89 Conference in Wrexham last September. The process effectively removes the need for chlorine bleaching with all its environmental implications.

The horrible brown mess which emanates from some pulp and paper mills present an economic dilemma to small paper-producing industries. The large mills are able to separate the lignin derivatives responsible for the colour but mills producing less than 50 tonnes/day of paper cannot afford the separation process and despite biological waste water treatment, the lignin derivatives either go relatively unscathed into the environment, or need to undergo chlorine bleaching. Both these options pollute. The wastewater discharges from the mill at Ahmedgarh fell outside the federal permissible limits governing such discharge in India.

Decolorization after treatment with the fungus was found to be directly proportional to its growth. Fungal growth increased with supplementation of the broth by carbon and nitrogen sources, namely glucose and asparagine, in an optimised C:N ratio 100. Under these conditions P. chrysosporium transformed the waste from 'effluent brown' to a delicate shade of yellow (some 68.9% colour dilution) in five days. (*Chem & Ind.* 9/18/89, p. 576).

NEW DRUGS FROM TRANSGENIC PLANTS

Important pharmaceuticals such as anti-clotting agents and growth hormones could soon be produced on a large scale by genetically engineered plants Plant Genetic Systems (PGS) of Belgium announced last August. Pharmaceutical peptides can now be produced in the seeds of rapeseed oil, using the technique developed jointly with scientists at the University of Ghent.

The Company foresees itself becoming a 'molecular farmer'. It plans to grow transgenic plants and sell the peptides to pharmaceutical companies. It reports that an agreement has already been reached with one major pharmaceutical firm. Although animals are also being engineered for the production of pharmaceuticals, PGS belives plants are more cost effective. The extraction and purification processes are also said to be efficient. (*Chem & Ind.* 3/6/89, p. 120).

UK RESEARCHERS REPORT A NEW BREAKTHROUGH IN ANTIBODY MANUFACTURE

Scientists at the UK Medical Research Council (MRC) in Cambridge claim a novel breakthrough in antibody manufacture that could prove cheaper and more effective than monoclonal antibody technology.

The new approach relies on the ability to clone specific genes and introduce them into E. Coli bacteria. But the key to the breakthrough is seen to lie in the discovery that these cloned bacteria-produced antibodies have been found to attack antigen molecules very specifically. Antigen-binding activity can be detected in as little as three days of harvesting the spleen of an immunized animal, compared with the week long process of monoclonal antibody manufacture.

Antibodies in the human bloodstream are made of four proteins linked together: two 'heavy chains' and two 'light chains' each of which contained 'variable domains' responsible for recognizing antigens. The bacterial versions are made of the 'heavy chains' only.

'Isolated variable domains may offer an alternative to monoclonal antibodies and serve as the key to building high affinity human antibodies' claim Greg Winter and Sally Ward of MRC in the science journal Nature of 12th Oct 1989. The new molecules, which the scientists have dubbed singl
antibodies are only 10-fold les
in antigen binding than the
antibody molecules.

Patents on new technology
applied for by the MRC. Sing
antibodies could hold wid
potential, from rapid clea
toxin's from the body tiss
example, in cases of drug ove
cancer therapy. However,
stresses that the studies to c
been very much on a 'mode
and much work needs to be c
to generalize the technology

The researchers are now co
ing on matching up 'light c
bind to the 'heavy chains'. Th
increase the binding affinity.
Carey of Celltech described th
ery as 'extremely important'
ously of great significance.
10/23/89 p.27)

A NEW TECHNOLOGY POTATO WASTE INTO GRADABLE PLASTICS

A new process that biologic
verts food processing waste
acid and then uses the lacti
make environmentally safe,
photo-degradable plastics wa
oped at Argonne National La
(Argonne, Ill.). In this new rou
(from such sources as potato
cheese whey) is enzimaticall
lyzed to glucose. The glucose
hydrolysis products are subs
fermented by bacteria that
lactic acid (L. Lactis), which
nously recovered, concentr
further purified into a polym
product.

Few, if any of the degradab
currently available, including
containing starch, degrade to
compounds, have suitable phy
mechanical properties are cost
On the other hand polymers
polymers made from lactic a

mechanical properties and lity, and the availability of feedstock and cost-effective rsion and recovery processes imulate the use of lactic acid ng bio and photo-degradable (*Chem-Eng*, 9/1989, p.19).

ECH'S PROF. DAVIDSON WELCH AWARD IN CULAR BIOLOGY

nistry professor Norman R. on of California Institute of logy has been named recipient 1989 Robert A Welch Award in stry. Davidson, a physical chem- neered the introduction of a r of novel techniques and discov- ontributing to the understanding etic materials.

Foundation notes that many of on's conceptual breakthroughs in ular biology have provided pow- chniques for getting insights into NA and RNA work. Also of gnificance have been (David- kinetic and mechanistic studies association of complementary and ly complementary single strands leic acids and the development of ds that reveal the sequences in various nucleic acid molecule.

Welch Award in USA is ted each year to a researcher in chemisty for career contributions in chemistry and related sciences for the benefit of humankind. The 1989 award consists of $225,000 a gold medallion and a certificate. (*C & EN.*, 7/3/89, p. 26).

HANDBOOK OF ANAEROBIC FERMENTATION

Larry E Erickson and Daniel Y.C. Fung of Kansas State University have edited the Handbook on Anaerobic Fermentation recently published by Marcel Dekka Inc. The price of this 800 page book is $149.75. This stiff price will make this valuable reference handbook a rarity in India except in few selected libraries. (*Biotech Prog.*, 6/1989, p. J10).

A NEW BACTERIUM THRIVING ON CHEMICAL SOLVENTS IDENTIFIED

A solvent tolerant solid bacterium of the Pseudomonas strain that thrives on toluene, xylene, styrene, and other chemicals has been discovered by Akira Inone, a member of the Horikoshi Super bugs Profect (named for its director, Koki Horikoshi, of Japan's Institute of Physical and Chemical Research). The researchers are now working on transferring this solvent tolerance to other bacteria used in industrial processes.

This $15 million, 5-year project was sponsored by the Exploratory Reserch for Advanced Technology (ERATO) programme of the Science & Technology Agency. ERATO coined the word superbugs to refer to bacteria that live under conditions of extreme pH, temperature, pressure and salinity. By analyzing solvent sensitive mutants, reserchers have identified several genes responsible for solvent tolerance. (*Chem Eng*, 10/1989, p. 21-23).

PRODUCING MAGNETIC PARTICLES WITHIN BACTERIA — A NEW INSIGHT

A spin-off from Superbugs Project of Japan is a better understanding of how magnetic particles are produced by magnetolactic. According to researcher Tom Hamaya, now with Meiji Seika Kaisha Ltd's Bioscience Laboratories (Sakado City, Japan) many small (150-250 nm) magnetic particles are produced via enzymatic action.

Initially, a hydrophobia matrix of iron hydroxide; then crystallization occurs, forming magnetits. The key to the conversion, says Hamaya, appears to be the pH (generally about 6-605 before the reaction) and oxidation reduction potential of the environment, rather than the enzyme itself, urease. Further, the properties of the magnetite can be controlled by changing the reaction conditions.

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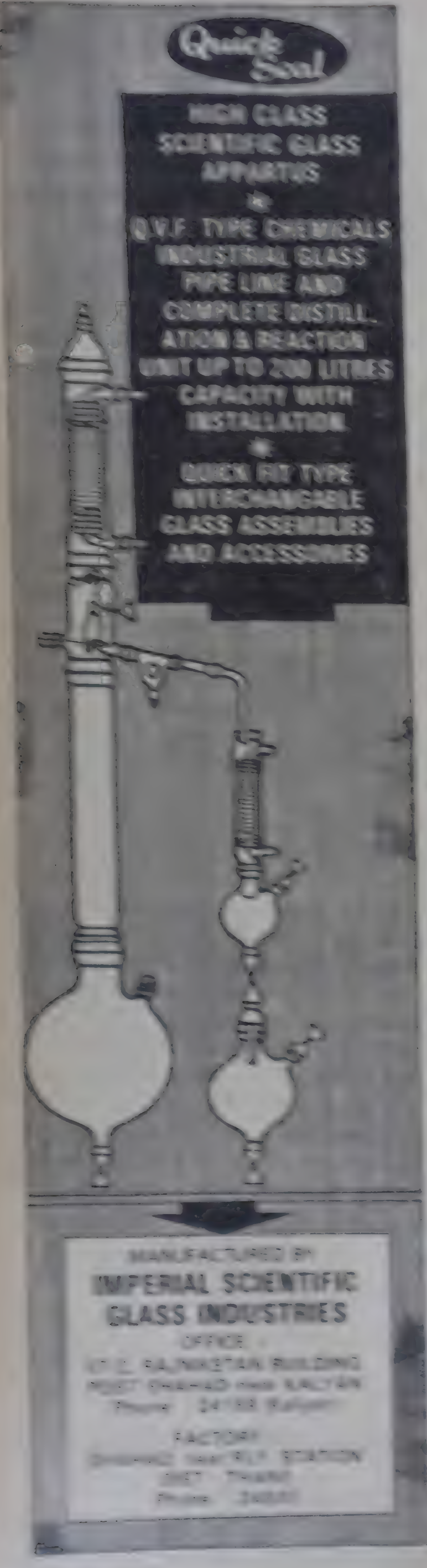
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Preparation and properties of phenyls

(MRS) RAKHSHINDA PANDA* & HIMADRI PANDA**
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The Indian Turpentine & Rosin Company Limited
P.O. Clutterbuckganj 243502, Bareilly (U.P.)

ract

he preparations and properties of different types of solid liquid phenyls are described. Their economics and indu- l feasibilities are also carried out.

roduction

ollution is one of the major problems facing the world ay. Considerable advances have been made in industrial lution abatement technology. However, accumulation of lutants on a global scale is a cause of concern and the prob- n is becoming more urgent with the spread of industri- sation. In other words, pollution exposes danger of ections, which ultimately drags the mankind towards death. sinfectants play a vital role to minimise these infections ploughing antibacterial agents. So the time has come to nk for the cheaper disinfectants which kills maximum bac- ial microorganism with minimum effect to human skin, that every common man can purchase, handle and use it. enyl is one of the disinfectants widely used throughout the rld in many miscellaneous forms.

Phenyl, a black disinfectant fluid is an emulsion, in the rm of homogenous solution prepared from coal tar acid frac- ns with the addition of suitable emulsifier, i.e., soap. ccording to drugs and cosmetics rules, it shall not contain ss than 40% W/W coal tar acids, phenolic compounds and al tar oils and shall have a phenol coefficient of not less an 18 (grade 1), 10 (grade 2) or 5 (grade 3). It shall not ntain quarternary ammonium compounds, mercury salts, rosene or other non-phenolic petroleum distillates. Accord- g to Indian Standard Institution (ISI) specifications, the dis- fectants should also be graded only on the basis of rformance test, rather than on their composition.

n this communication, approach has been adopted and sep- rate grade in line with scheduled 'O' of drugs and cosmetic les have been incorporated. The requirements for stability s storage have been modified. Its economics and industrial asibilities have also been put forward and calculated.

A good phenyl should have the following physical prop- rties:

1. It should be miscible and should give a translucent off-white to white solution with the addition of artificial hard water.
2. It should form a complete homogenous mixture with uniform viscosity.
3. Different oils which were added during its preparations/ manufacture, should not be floated above the surface of the solution.
4. It should be stable upto date of expiry marked by the manufacturer, when stored at the upper and lower limits of the temperature ranges.
5. It should not be corrosive and poisonous to higher organisms.
6. It should not leave any unpleasant odour or stain in the area of use.
7. It should not contain any quarternary ammonium compounds, because the same is not compatible with the above composition because of their cationic character.
8. Germicidal value of the phenyl shall be ascertained by determining the Riedeal Walker and Staphylococcal co-efficient and should be expressed in terms of phenol coefficient. This phenol co-efficient is also an indication of the dilution at which the disinfectant may be employed.
9. It should be packed in mild steel, tinned mild steel or other suitable containers. Galvanised iron sheet containers shall not be used.
10. The containers shall be clearly and indelibly marked with the following details: a. Name of the material; b. Manufacturer's name, initials or trade mark; c. Class, grade and type of the material and the phenol co-efficient; d. Month and year of manufacture and batch number; e. Date of expiry; f. Volume of material in the container; g. Any specific instructions for use; h. A statement that mercury compounds have not been added to the product.

Experimental

1. Raw materials used

Cotton seed oil, castor oil, linseed oil, ground nut oil, tallow of beef, goat and mutton, creosote oil, cresylic acid, gum rosin, caustic soda used are of commercial type. Their compositions are shown in Tables 1, 2 and 3.

2. Methods of preparation

Different types of phenyls were prepared as follows: At first soap was prepared by mixing rosin or fatty acids with alkali at 115 ± 5°C in a 5 lts. beaker. Then the soap solution was prepared by mixing the above soap with distilled or soft water and was maintained at 52 ± 5°C. The above content was stirred vigorously till the mixture was homogenous and cooled to room temperature. To it, calculated quantities of cresote oil and cresylic acid were added and mixed thoroughly to get a homogenous paste or solution. In case of liquid phenyl, required quantity of distilled or soft water was added to get the desired viscosity.

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* To whom all correspondence should be addressed.

** Devashish Consultants (P) Limited, 1, Station Road, P.O. Clutterbuck- nj 243502. Bareilley (U.P.).

In the preparation of phenyl, the COOH group of resin acids or fatty acids of different oils or tallow reacts with sodium hydroxide to form soap. These soaps then react with creosote oil, which is of naphtheic odour, frequently contains substantial amount of naphthenate and its derivatives to produce sodium naphthenate and other metal salts. To increase the water solubility of the above solution, a little amount of cresylic acid is also always added. These metal salts then react with -OH group of cresylic acid, which is a commercial mixture of cresols containing xylenol and a small amount of phenol. The reason for the term 'acid' here as well as in the trivial name of phenol is that the hydroxyl group attached to the aromatic ring has a distinct acidic character, which also increases the germicidal value of the disinfectant. Cresylic acid also acts as the preservative for the phenyl because of its phenolic character. The probable reaction is shown below. Experimental details are shown in Table 4.

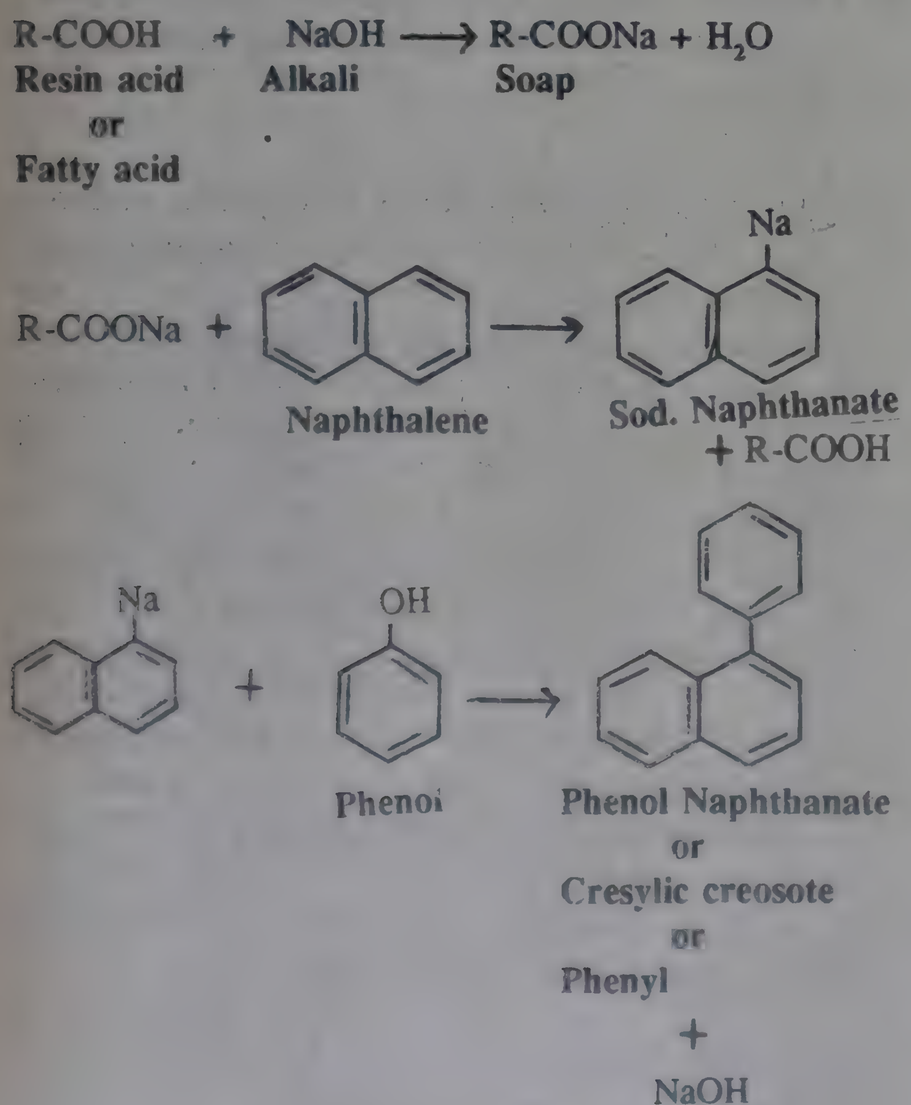
R-COOH + NaOH ⟶ R-COONa + H₂O
Resin acid or Fatty acid
Alkali
Soap
R-COONa +
Naphthalene
Na
Sod. Naphthanate + R-COOH
Na
+
OH
Phenol
Phenol Naphthanate or Cresylic creosote or Phenyl + NaOH

Fig. 1 Probable reaction of phenyl

Analysis

The value of a disinfectant agent in general can not be determined by a chemical test method. Effectiveness must instead be judged by using one or more bacteriological tes procedures directed towards assessing the value of the agen in the intended application. Standard test procedures hav been developed which will meet most requirements.

1. Stability after dilution

This procedure is intended to conform and supplement th findings of the phenol co-efficient test by determining th maximum dilution of a disinfectant which is effective in practice.

Preparation of artificial hard water

40 ml of N/l hydrochloric acid was neutralised with a sligh excess of calcium carbonate and filtered. The filtrate was diluted to 1000 ml with distilled water, 10 parts of this solution was further diluted to 100 parts with distilled water.

Procedure

To 475 ml and 495 ml respectively of the artificial hard water contained in each of two 500 ml stopper measuring cylinders at a temperature between 15°C and 45°C, 25 ml and 5 ml respectively of the phenyl were added and emulsified by inverting and righting the cylinders 30 times. The cylinders were maintained at a temperature between 15°C and 45°C for six hours and examined by reflected light. Not more than a trace of separation occured at the top and bottom. Results are shown in Table 5.

2. Percentage of coal tar oils, coal tar acid and phenolic compounds in phenyl

10 g of the phenyl accurately weighed was shaken with 5 ml of saturated solution of sodium chloride and transferred to a 250 ml separating funnel. 50 ml of solvent ether, precooled to 15°C-20°C, was added. The mixture was shaken vigorously and allowed to stand. 3-4 ml of ethyl alcohol may, if necessary, be added to hasten separation into two layers. The aqueous layer was run off into a second separating funnel (150 ml) and extracted with 2 more portions of 20 ml each of solvent ether. The ether extracts were collected together and washed twice with 25 ml of distilled water each time and the aqueous portions were rejected. The ether extract was finally collected into a 250 ml wide mouthed flask or beaker (containing a few glass beads) through a layer of anhydrous sodium sulphate. The separating funnel was washed with about 20 ml of solvent ether and this was collected into the flask or beaker through the same layer of anhydrous sodium sulphate. The ether was distilled off and the residue dried to constant weight on a steam bath. From the weight of the residue, the percentage of coal for acids and oil was calculated

3. Germicidal value

This procedure describes two biological methods of evaluating the germicidal property of phenyl. Each test requires different conditions for examination of the phenyl.

. *Determination of Rideal Walker (RW) co-efficient*

All apparatus used in the test were scrupulously cleaned d sterilised immediately before use.

PECIAL APPARATUS

noculating loop

4 mm in internal diameter formed at the end of a length 28 S.W.G. (0.376 mm) wire of platinum or platinum iridm alloy measuring 38 mm from the loop to the holder. The op was bent at such an angle as will facilitate its removal ertically from the surface of the liquid.

ncubator

It was maintained at a temperature of 37 ± 1°C throughut the period of incubation.

Constant temperature water bath

It was maintained at 17°C and 10°C.

Dropping pipette

It was made to deliver 0.2 ml in about 5 drops.

Broth tubes

These were neutral, hard glass tubes of dimensions approximately 12.5 x 2 cm.

Medication tubes

Plugged 12.5 x 2 cm test tubes were used.

Autoclave

All the apparatus used for phenol co-efficient test was sterilised at 7 kg/cm^2 pressure at 121°C in the steriliser.

Culture medium

20 g of Lab Lemco, 20 g of peptone and 10 g of sodium chloride were dissolved in 1000 ml of distilled water. The solution was boiled for 30 minutes, cooled and made up to 1000 ml with freshly boiled and cooled distilled water. 20 ml of this broth was titrated at 30°C with N/10 sodium hydroxide solution, using 0.1 ml of 0.5 percentage phenolphthalein solution as indicator. By calculation from this titration, the bulk of the broth was neutralised with N/1 sodium hydroxide solution and boiled to precipitate phosphate and filtered while hot. The broth was adjusted to pH 7.6 by the addition of N/1 hydrochloric acid, using a comparator with phenol red as the indicator and sterilised by heating in an autoclave. After cooling, the broth was filtered and distributed in 5 ml quantities into sterile broth tubes and sterilised in an autoclave at 121°C (15 pounds per square inch) for 10 minutes. The final reaction of the broth was between pH 7.3 and pH 7.5.

Culture

Cultures of Salmonella typhi (786) Bacterium typhosum was used. This culture was maintained in the laboratory, by weekly subculture on a nutrient agar slope (made by dissolving 2.5% agar in the broth prepared as above incubating the slope for the first 24 hours at 37°C and then keeping it cool preferably below 22°C. A little of growth from a stock agar slope culture was transferred to a 5 ml broth tube and incubated at 37°C for 24 hours. For subsequent generation a standard loopful of the culture was transferrred to a fresh broth tube and incubated at 37°C before. Only cultures which have been grown for 24 hours at 37°C as before and only those between the third and fourteenth generation were used.

Standard phenol

A 5 per cent W/V solution in sterile distilled water of chemically pure phenol having a crystallising point of not less than 90.5°C was prepared. Test dilutions were prepared from their stock solution containing 1 g of phenol in each 95, 100, 105, 110 and 115 ml of solution. These dilutions were used within a week of preparation.

Test solution of phenyl

The sample was mixed thoroughly, 5 ml was withdrawn in a capacity pipette and discharged into about 480 ml of sterile distilled water in a 500 ml glass-topped sterile measuring cylinder, and the pipette rinsed in the clear liquid. The solution was diluted to 500 ml and mixed thoroughly by a cork screw motion. Serial test dilutions were prepared by mixing up 5 or 20 ml amount of this solution to the appropriate volume, with distilled water. The dilutions were made in arithmetical series, spaced in units of 50 i.e. 1 in 100, 1 in 150, 1 in 200 and so on upto 1 in 400, and in units of 100 thereafter.

Procedure

5 ml of each of the chosen dilution of the phenyl were measured into four sterile medication tubes and placed in a suitable rack alongside the 24 hours broth culture and fifth tube containing 5 ml of one of the standard phenol dilution in a water-bath maintained at 17°C to 18°C. When the contents of the tubes and the culture reached the temperature of the water bath, 0.2 ml of the culture was added to the first tube and shaken gently. After 30 seconds, the second tube was sub-cultured and so on until the fifth tube had been innoculated. 30 seconds after the last innoculation, i.e., 2.5 minutes after the first, the first tube was shaken and one standard loop full of the mixture with subcultured in a 5 ml tube of broth. The procedure was repeated at 30 seconds intervals until the whole cycle had been repeated four times i.e. until each medication tube had been subcultured after 2.5, 5, 7.5 and 10 minutes disinfection time. The broth subculture tubes were incubated at 37°C for not less than 48 hours and not more than 72 hours. The presence or absence of growth in each tube was recorded. If there was any evidence of contamination in the broth tube, the whole test is to be discarded or repeated.

Calculation of the phenol coefficient

The phenol coefficient was calculated by dividing the dilution of phenyl, which shows life after 2.5 and 5 minutes, but not after 7.5 and 10 minutes, by that dilution of phenol which shows the same end point. Typical test results are shown in Table 5.

Table 4
Preparations of different types of phenyls

Sample No.	Rosin	Linseed oil	Cotton seed oil	Castor oil	Sulphonated castor oil	Ground nut oil	Tallow	NaOH	Creosote oil	Cresylic acid	Chlorinated creosote oil	Phenol	Soft water
	g	g	g	g	g	g	g	g	g	g	g	g	ml
1	115	41	-	-	-	-	-	20	160	0.5	-	-	700
2	120	-	45	-	-	-	-	28	180	0.8	-	-	685
3	125	-	-	44	-	-	-	23	175	0.6	-	-	690
4	122	-	-	-	40	-	-	25	160	-	0.5	50	600
5	145	-	-	-	-	38	-	30	190	0.9	-	10	750
6	-	-	-	200	-	-	-	35	450	0.4	-	-	800
7	-	-	-	-	205	-	-	38	480	0.3	-	-	800
8	35	-	-	-	-	-	130	40	500	0.35	-	10	-
9	35	-	-	40	31	-	120	55	540	0.9	0.3	5	-
10	100	20	10	10	-	-	-	35	250	0.45	0.2	10	750

Table 5
Properties and economics of phenyl

Sample No.	Stability after dilution	Mercury salts	Quaternary ammonium compounds	Germicidal value		Available chlorine germicidal equivalent concentration	Yield %	Cost per 450 ml bottle Rs. P.
				R.W. coefficient	Staphylococcal coefficient			
1	P	A	A	6.8	6.75	-	100	3-50
2	P	A	A	12.6	12.0	-	100	3-60
3	P	A	A	18.0	18.4	-	100	3-40
4	P	A	A	18.1	18.6	Pr	100	5-00
5	P	A	A	12.2	11.9	-	100	4-10
6	P	A	A	14.7	13.9	-	100	3-50
7	P	A	A	17.5	18.0	-	100	4-80
8	P	A	A	18.0	19.1	-	100	3-00
9	P	A	A	19.0	19.6	Pr	100	3-20
10	P	A	A	12.3	12.2	Pr	100	5-50

Table 1
Characteristics and composition of oils, tallow and rosin

alysis	Cotton seed oil	Castor oil	Linseed oil	Groundnut oil	Tallow Beef	Tallow Mutton	Tallow Goat	Gum Rosin
line number	105	89	175	95	49.5	41.2	-	150
ponification number	195	176	189	190	197	197	180	175
id number	14.24	0.81	3.42	.910	-	-	-	166
ler, °C	34	-	19	31	42.3	40.0	46.2	-
elting point, °C	-	-	-	-	-	-	-	60
CIDS								
yristic	1.5	-	-	3.7	4.6	2.1	-	-
almitic	23.4	-	4.9	-	27.4	24.6	25.5	-
earic	1.2	-	2.5	-	29.4	30.5	28.1	-
leic	22.9	1.0	26.4	-	25.9	36.0	38.4	-
inoleic	47.8	4.5	22.2	-	-	-	-	-
inolenic	-	-	39	-	-	-	-	-
icinoleic	-	85	-	-	-	-	-	-
bietic	-	-	-	-	-	-	-	33
leo-abietic	-	-	-	-	-	-	-	14
alustric	-	-	-	-	-	-	-	6
imaric	-	-	-	-	-	-	-	23

Table 2
Specifications for commerically available creosote oil

roperties	Type	1	2	3	4
pecific gravity, 20/20°C		1.06	1.07	1.09	1.10
oisture, % Max.		0.3	0.2	0.3	0.3
lash point, (closed up), °C		164	164	165	166
istillation, °C					
5%		200	218	222	240
50%		230	250	240	290
95%		380	399-400	395	400
omposition, %					
Naphthalene		30-50	65	70	85
Methyl naphthalene		5-10	3	10	5
Biphenyl		2 Max	2	2	5
Ethyl naphthalene		12-25	8	3	2
Acenaphthene		5-6	8	4	2
Diphenylene oxide		2	2	2	2
Fluorene		5	2	9	1

Table 3
Specifications for commercially available cresylic acids

roperties	Type	1	2	3	4
pecific gravity, 20/20°C		1.031	1.028	1.037	1.023
oisture, % Max		0.3	0.2	0.3	0.5
ar base, % Max		0.1	0.05	0.15	0.1
il and naphthalene, %		<0.1	<0.1	0.1 Max	0.1 Max

Distillation, °C				
5%	204	208	216	193
50%	207	214	217	202
95%	222	224	220-225	220-225
Composition, %				
Phenol	4-10	0.5 Max	6 Max	10-22
o-Cresol	4 Max	0.5	20-30	10
m, p-Cresol	30 Min	46-50	63	80-85
2,4- + 3,5- + 2,6-Xylenol + o-ethyl phenol	10-20	8 Max	15 Max	20 Max
2,3- + 3,5-Xylenol group	30-40	40-44	4 Max	5
3,4-Xylenol + m,p-isopropyl phenol	8 Max	20 Max	-	-

3B. Determination of staphylococcal coefficient

This method is a modification of the test for determination of Rideal Walker coefficient. The apparatus and procedure was same but organism and culture medium were different. It was intended to ensure that disinfectant fluids were not unduly selective in their germicidal property.

Apparatus

The apparatus is same as described above.

Culture medium

5 g of meat extract, 10 g of peptone both of microbiological grade and 5 g of sodium chloride were dissolved in 100 ml of distilled water. Sufficient amount of 1N sodium hydroxide solution was added to bring the pH value at 20°C to approximately 7.0. Broth in bulk was sterilised by autoclaving for 20 minutes at one atmospheric pressure, at the end of which the filtered through a filter paper and 10 ml quantities were placed in broth tubes which had been previously cleaned, plugged and sterilised. The tube was sterilised with the content at one atmosphere (121°C) for ten minutes. The final reactiion of the medium was between pH 6.8 and 7.0.

Culture

This was staphylococcus aureans (NCTC 3750) cultures.

Procedure

As described for Rideal Walker coefficient.

Calculation

Staphylococcal coefficient was obtained by dividing that dilution of the phenyl which shows life in 2.5 and 5 minutes, but no life thereafter, by that dilution of phenol (1:80, 1:85, 1:90, 1:95 or 1:100) which shows life in 2.5 and 5 minutes but no life thereafter. Results are shown in Table 5.

3C. Available chlorine germicidal equivalent concentration

The phenol coefficient test was not generally suitable for evaluating chlorine compounds, as the values obtained are ordinarily low, indicating that the compounds are less effective than is actually the case. However chlorine compounds may be evaluated by using the available chlorine germicidal equivalent procedure. This test was intended to evaluate di
infectants to be used on hard surfaces. For such agents, reser
capacity and rapid action were essential. The disinfecta
agent under test was directly compared with a hypochlori
solution of known strength. Again this test was intended f
use with water miscible materials. Results are shown in Tabl
5.

3D. Quarternary ammonium compounds

0.2 mg of phenyl was transferred into a separatory funne
2 ml of 10 per cent sodium carbonate solution and 1 ml
0.04 per cent bromophenol blue solutions were added to i
The content was diluted with 50 ml of distilled water, 15
of chloroform and shaked gently for 1 minute and the
allowed to stand for 5 min. A blue colour in the chlorofor
layer indicates the presence of a quarternary ammonium com
pound.

Conclusion

Table 5 shows that all types of phenyls pass their dilutio
as well as germicidal tests. So their economics were calc
lated after its successful trials on pilot plants which are als
shown in Table 5. The preparations of phenyl involves a ver
simple method. Its economics and industrial feasibilities a
also excellent.

Acknowledgements

Thanks are due to Dr. B.K. Gupta of Indian Veterina
Research Institute, Izatnagar (U.P.) for carrying out some
the microbiological tests.

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1984, Vol. 2, 62.

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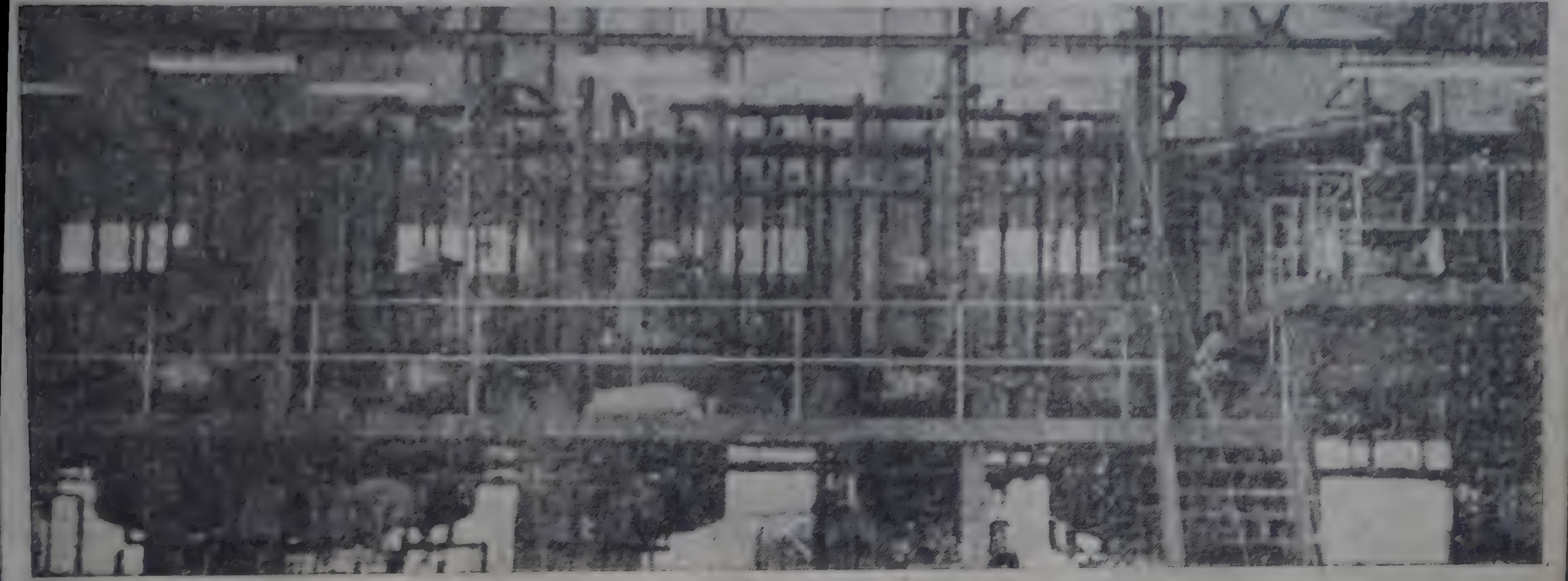

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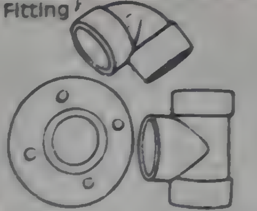
P.P. Cocks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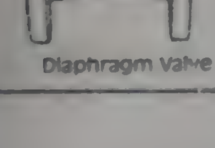
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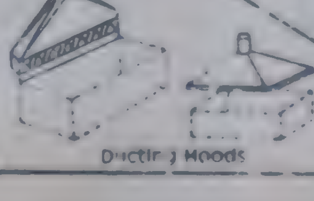
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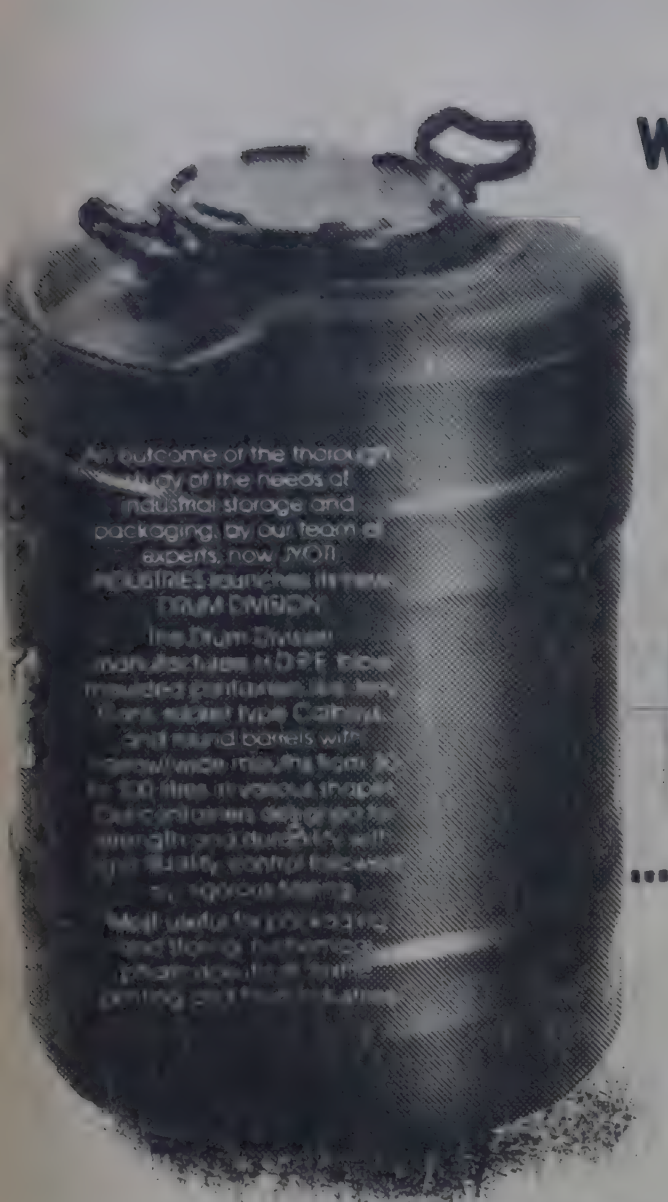

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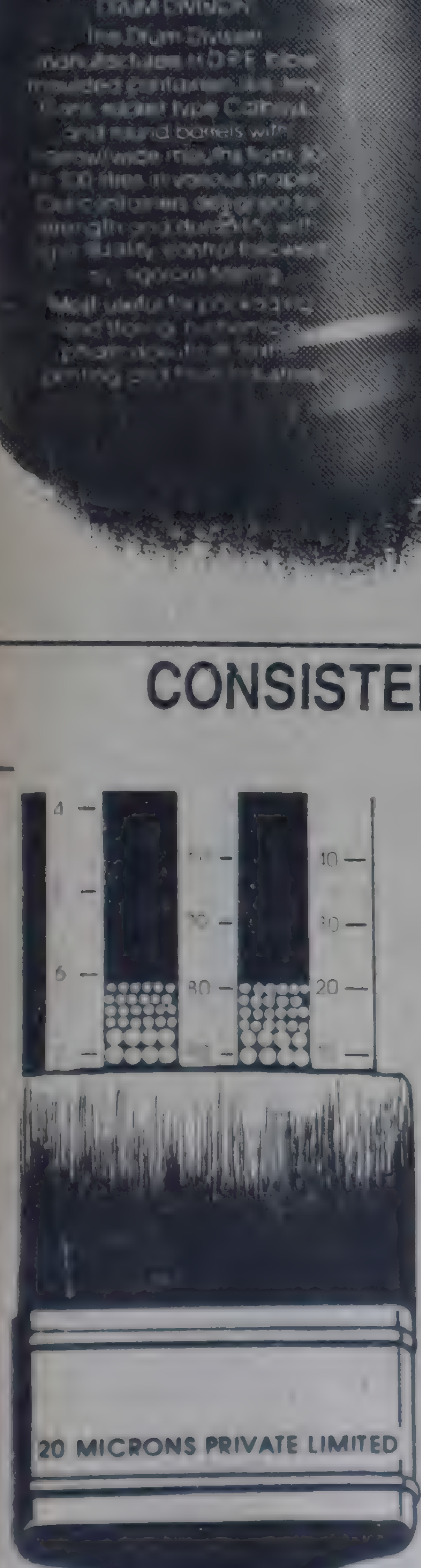

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Distillery and dry ice

A.K. DAS
Industrial Adviser (Chemical), D.G.T.D.

Mr. A.K. Das (born 1939) has specialised in and has vast experience in the field of petrochemicals, food & fermentation technology and he is currently Industrial Adviser (Chemicals) in D.G.T.D. After taking his B.Sc (Hons.) and M.Sc. degrees in chemistry from Calcutta University, he was awarded C. Chem, MRSC from the Royal Society of Chemistry, London and has done Post Graduate specialisation in Environmental Control in Chemical & Pharmaceutical Industries from University of Ghent, Belgium. He has received inplant-specialised training in organic chemicals, petrochemicals and plastics fro GDR.

He has also attended a course on 'Choice of Proper Technology' from University of Strathclyde, Glasgow and course on 'Project Appraisal' from Indian Institute of Management, Bangalore, besides other specialised training programmes. He is proficient in Russian and German languages. Widely travelled in India and Europe, Mr. Das has been with D.G.T.D. since September, 1972 in various capacities and dealing with various chemical industries.

Sugar Industry has been stated to be the second largest among the processing industries in India next only to Textile. Indian mythology supports the fact that India has been known as the original home of sugar and sugarcane. However, the advent of modern sugar processing industry by direct vacuum pan method may be said to have started with the adoption of the policy of discriminating protection by the Government of India in 1932. Consequent to this protection, the number of sugar mills from scanty 32 working units in 1931-32, rose to 130 by 1934-35 and the volume of sugar output which stood at 1.62 lakh tonnes rose to 9.47 lakh tonnes by 1935-36.

With the firm footing of sugar industry in the country, the production of alcohol also started in 1931 when about 19 distilleries were set up having a total production of 3.7 million litres of potable alcohol in that year. Between 1931 and 1947, the production of alcohol increased to 60 million litres. Between 1947 and 1960, the number of distilleries increase to 51 and the production reached 81 million litres. Fro 1960-1966 the production of alcohol rose steeply due to grow ing demand and increased availability of molasses an reached a level of about 195 million litres in 1966. The production of industrial alcohol in some subsequent years is a follows.

Alcohol (year)	Production (in million litres)
1973-74	367.97
1976-77	585.20
1980-81	430.80
1983-84	575.90
1987-88	636.20

At present, there are about 200 distilleries in the country manufacturing industrial alcohol utilising the bye-product molasses from sugar industry. Utilisation of molasses for the manufacture of industrial alcohol is also a direct way of pollution control for sugar industry. If there was no proper utilisation of molasses, this could pose a serious environmental problem.

Although, the fermentation of fruits to alcohol was known to primitive humans and making of various beverages out of fruits and grains has been well established for centuries, only during the past generation wider application of this procedure has been recognised. Industrial alcohol was an outgrowth of alcoholic beverages but now it has become important by virtue of its economically useful properties as a solvent and for synthesis of other chemicals. Molasses, because of its strong concentration of sugar, does not support direct fermentation. It must first be diluted to a concentration of upto 17% sugar. This is called mash and represents the carbohydrates ready for yeast innoculation. It is pumped to large steel fermenters, closed in modern plants, to collect carbon dioxide evolved and to afford easier conditions for cleansing and sterlisation. The principal reaction in alcohol fermentation is as follows:

Equation of invertion

$$\underset{\text{Sucrose}}{C_{12}H_{22}O_{11}} + H_2O \xrightarrow{\text{Invertase}} \underset{\text{d Glucose}}{C_6H_{12}O_6} + \underset{\text{d Fructose}}{C_6H_{12}O_6}$$

Equation of fermentation

$$C_6H_{12}O_6 \xrightarrow{\text{Zymase}} 2C_2H_5OH + 2CO_2$$

In the process of fermentation to alcohol, carbon dioxide is evolved. In our country, fermentation is carried out mostly in open fermentors and the carbon dioxide is let to the atomsphere which carries with it some alcohol vapours also. Carbon dioxide has a big role to play in a nation's upliftment of economy. At present, there are 18 industrial units which manufacture carbon dioxide including liquid carbon dioxide with a total installed capacity of 25.4 thousand metric tonnes. The production of carbon dioxide during the last two years was of the order of 15000 metric tonnes. The production of this gas has also been stagnant and capacity utilisation is not improving appreciably. Carbon dioxide is a versatile material and has got many uses in gaseous, liquid and also in solid (dry ice) form. The existing distilleries in the country should think for recovering the carbon dioxide from their fermenters and further convert into liquid or to solid form. This will give them economy and once dry ice is available in the market freely, there is immense scope for its demand to increase in various industries. Theoretically, a tonne of alcohol evolves equal quantity of carbon dioxide gas i.e. in other words during 1987-88, the production of 6 million litres of alcohol evolved 508 million kgs. of carb dioxide which was just allowed to escape into the atomspher If a part of this quantity could be collected, atleast in larg distilleries with some marginal investments, the country cou get readily a versatile material for various industrial purp ses. Lately, importance has been given by the Governme to processed Food Industry which also generated intere among the medium scale entrepreneurs. This discussion w be restricted in the application of carbon dioxide in vario forms. (that is gas, liquid and solid) as may be applicab to food processing industry.

Dry ice is the common name for compressed, solid carb dioxide. Its appearance is like a pressed block of snow b with a waxy look. Unlike snow, dry ice does not melt b sublimes leaving no residue. It has a temperature of 79° and is the most concentrated form of cold available. As refrigerant, dry ice will remove over five times the quanti of heat compared with the same volume of water ice. It totally non-corrosive and does not contaminate the produ it freezes. It is easy to handle.

Beer and Soft Drink Industry:

CO_2 is used to ensure that the beer and mineral wa retains a fresh taste and to provide a higher degree of pr servation by reducing the pH-value. The fact that is also pr vides aeration and bubbles, is a further optical improveme of the product concerned.

CO_2 applied in slaughterhouses:

In order to stun animals before they are slaughtered t animals are led through an atmosphere of 68-70% CC After just 10 sec. the animal will be unconscious. This meth of slaughtering gives a better quality of meat, because t musculature is relaxed. Further, the meat production is abo 600g larger per animal, because the butcher can cut mo close to the bone due to the relaxed musculature. This meth is applied at 95% of the Danish slaughterhouses.

CO_2 in green houses:

Tomatoes, cucumbers and many other vegetables are gro ing more rapidly and get larger and more fleshy by addi CO_2 to the air. Further, the durability after harvesting considerably prolonged. CO_2 added to flowers during t period of growing implies the same advantages.

CO_2 in the packing of Foodstuffs:

Almost all food stuffs can with advantage be packed a CO_2 atmosphere. The shelf life of the products will prolonged, and as a general rule the shelf life of the arti will be prolonged by 3-4 times. The shelf life is prolong because the CO_2 gas replaces the oxygen and slows dov the formation of bacteria.

plication of dry ice blocks:

Dry Ice Blocks have wide applications. Generally block es of 2-10 kgs. are used. Following are some of the main s:

- Transport of deep frozen foodstuffs
- Uni-Cool - new chilling/freezing system, where the temperature in a transport container can be regulated between - 35°C and + 5°C.
- Airline catering
- Medicine transport
- Laboratory use
- Shrinking of axles
- CO_2 fog, discotheques

Application of dry ice pellets:

Dry Ice pellets have a larger surface and therefore provide a more uniform cooling of the goods. Pellets are used in cases where blocks are too large and not convenient. The main uses of dry ice pellets are to mix into minced meat an fish transport.

Quick CO_2 freezing of foodstuffs:

CO_2 freezing of foodstuffs has become very widespread because perishable foodstuffs such as fish and meat are frozen in few minutes. Quick freezing of foodstuffs is done in freezing cabinet for small applications. In commercial plants, a freezing tunnel or a freezing spiral is generally used. The fresh goods are put into the tunnel and come out deep frozen in a few minutes. Freezing spiral is applied in cases where there is no sufficient room available for the long freezing tunnel.

The equipments for collecting carbon dioxide from distilleries are relatively simple and further processing it to liquid or solid state is not cumbersome. It is upto the distillery industry whether they will continue to allow a versatile material to escape into the air for years together.

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The system is divided into two parts, one is evaporator region and other as condensation region. The hot flue gas is passed through the evaporator region where working fluid is vaporised and travels to the condensation region through which cold fluid is passed. After condensation, working fluid again comes back to evaporator region for next cycle. Both the regions are separated to avoid any cross flow.

The system has got tremendous design flexibility. It is practically maintenance free. The positive sealings between hot and cold fluid section results in no cross contamination, minimise corrosion, extremely low pressure drops, compact and efficient than conventional heat exchanger.

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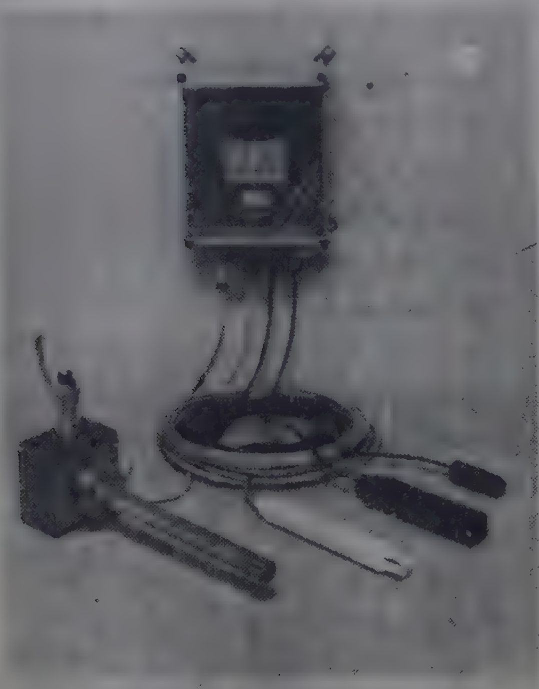

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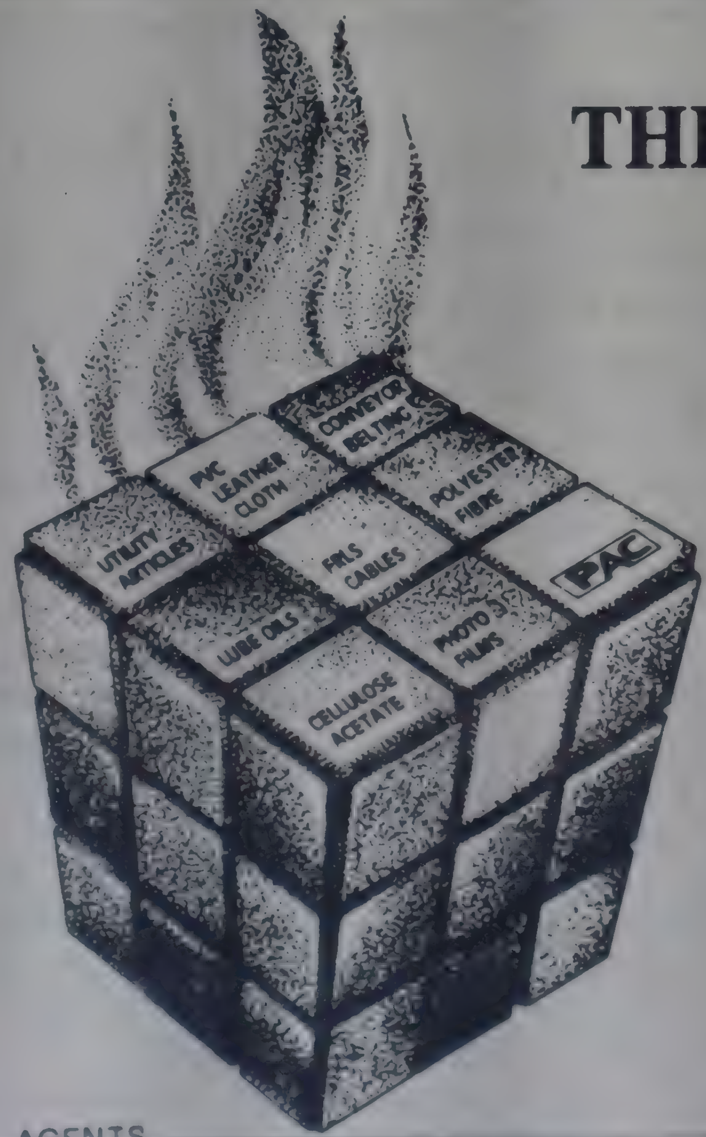

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thyl Alcohol for Chemicals in the Nineties

S.L. VENKITESWARAN

thirties saw the beginnings of Indian sugar industry. rties saw the use of waste molasses for making ethyl l. The late forties saw the use of ethyl alcohol directly iel for motor vehicles and early fifties saw the blend wer alcohol" and petrol as the motor fuel over much th India. The late fifties saw the beginning in the use yl alcohol for some chemicals and this gained such ntum that the use of alcohol as a fuel was abandoned 52.

potential for conversion of ethyl alcohol into chemand polymers was fully elaborated by the first com- under Dr. Nagaraj Rao in 1956 and the basic conditions ch develoment were clearly indicated. While the ini- jectives were realised problems on taxation and ade- supplies began creeping in and throttling the further oments. The problems were accentuated by the wide d downs in sugar production and the location of some user-industries far away from the production centres states which had to depend on suppies of alcohol from states, besides, the relaxation of prohibition of alco- drinks leading to a surge in liquor demands which was ainstay of state Government revenues. The basic ements for a healthy economically viable growth in ol-based chemicals were not met and there was little ess for nearly fifteen years.

veral committees attempted to tackle the problems but attention was devoted to the alleged lack of efficiency production of alcohol as if this was the primary factor ot the extraneous conditions which were out of the alco- roducers or users control. The efficiency in conversion ohol to chemicals has hardly ever been the subject of f these studies. The question of location of industries lasses centres for integrated production programmes has figured in the recommendations. The State Govern- levies have of course been a matter of primary con- nd a separate committee has gone into this but the mendations had to be accepted and implemented by willing State Governments concerned. At last a clear ion of the potential for ethanol-based chemicals on the f expected growth of the sugar industry had emerged report of the committee under Dr. Bhattacharya. But after came a report under Dr. Ganguli which ruled st most of the chemicals from ethyl alcohol rcommended e Dr. Bhattacharya Committee -- even of the simplest nost competitive item acetic acid and advocated pro- on of acetic acid from methanol in plants of large capac- hich could cater to most of the requirements. The obsession with "High-Tech" and solicitude for methanol usage had gone to such extremes as to forget about the problems with molasses disposal and even to the extent of placing ethyl alcohol-based industries on the "negative list" for assistance from the financial institutions. It was an uphill battle for over two years before these erroneous decisions were reversed and only recently has the way been cleared for acetic acid and other viable chemicals to be made from ethyl alcohol.

It will be useful to have a look at our sugarcane and sugar statistics and the extent of progress. The sugarcane acreage increase in the past 25 years, the rise in yield per hectare, sugarcane used for sugar production, usage of sugarcane for other purposes, large increase in sugar production in some states in recent years and overall production in India are given in Table I to III. Also the rise in molasses production and of its surplus as well as of alcohol and how it has been utilised recently are given in Tables IV and V. There are certain conclusions which are obvious.

1. Sugarcane acreage and yield has risen and is now about 200 million tonnes of sugarcane a year.

2. More of available sugarcane is used for sugar production because the use for gur and khandsari is nearly static and more sugar is recovered on cane, particularly in the states where sugarcane production has expanded.

3. Though not included in the data, the country's sugar demand is now over 10 million tonnes a year and rising at over 8% a year and there are presently imports to cover the gap between demand and production.

4. The production of sugarcane in different and widely separated areas makes it less affected by fluctuations in the monsoon and the earlier cycles of wide variations are over.

In this context it is but right that the targets of production have been raised -- to 12 million tonnes in 1994-95 and 16 to 18 million tonnes by AD 2000. The obvious fall-out of this is the need to gainfully utilise over 5 million tonnes of molasses by 1994-95 and 7 million tonnes by AD 2000. The data given earlier show that the bulk of the molasses has to be converted into ethyl alcohol and the offtake for potable alcohol is limited so that much larger quantities of the ethyl alcohol have to be converted into products of higher value and for import substitution. In the event of any conflicts in the production of specific chemicals as between alcohol-based and petro-based there has to be a pragmatic approach to ensure that the molasses disposal does not get upset. Export is no solution as a regular programme whether for molasses or alcohol.

The data indicate that about 500 million litres of additional alcohol are to be utilised for chemicals by 1994-95 and this will rise to 1000 million litres/year by AD 2000. We mentioned the need for pragmatic approach to see that the production programmes based on alcohol are not upset by programmes based on other feedstocks. This of course implies that the production programmes based on alcohol are properly selected for viability and do not lead to any burden on the consumers. The various chemicals that are conveniently and economically derived from ethyl alcohol have been described in several articles and need not be recapitulated here except for the chart of Ethyl Alcohol "Chemistree" reproduced here.

Alcohol is easily and efficiently converted to acetaldehyde by oxidation or dehydrogenation and acetaldehyde is the convenient intermediate for many other chemicals. Alcohol as a source of ethylene is economical but conversion of ethylene to many of its large volume derivatives like polyethylene, vinyl chloride, styrene or ethylene glycol is to be carried out on a much higher capacity level for economical production. Hence the ethylene-based derivatives are at a relative disadvantage when linked to ethyl alcohol because the quantity of ethyl alcohol at one location is limited. Ethyl alcohol lends itself to economic production at smaller levels of capacities only when the second stage conversion does not need to be at a far higher level of capacity. In cases where ethylene is reacted with another entity like chlorine, benzene, oxygen or ammonia there can be some meeting ground and opportunities for successful production from ethyl alcohol.

As already mentioned, after the intial flurry of programmes based on ethyl alcohol there was a setback for nearly a decade due to uncertainties in sugar and the tax problems on raw material. Then came up two major programmes for vinyl acetate based on ethyl alcohol. There has been a slowdown again except for the project for making 20,000 to 25,000 tonnes of ethylene glycol in an integrated programme based on molasses with alcohol made for captive conversion. We are now at a stage when new programmes have to be take urgently to absorb another 500 million litres of alcohol a by the end of 8th Plan and a further 500 million litre AD 2000. But it is essential that programmes are app riately thought out keeping the scale of operations requ availability of alcohol at a particular location, demand jections and competitive aspects, investments and for exchange savings etc. There are also some questions r ing to revival of old plants after years of stoppage due to wrong locations or other reasons. Even more important i need to avoid plans for over-ambitious projects which be inherently non-viable.

The overall picture of products and capacities and alc required for plants now in operation (excluding idle pla is in Table VI (October 1989). Also the firm program which are likely to be implemented in a year or two and a hol required for these. Also capacities which are appro with or without assured alcohol supplies. In the light of t the new projects which could be taken up urgently and a hol required for same are also indicated.

Apart from the large rise in sugar and molasses pro tion there is now the favourable judgment of the Supr Court that State Governments have no right to tax ethyl a hol in devious ways when it is for industrial uses. This cl the air for healthy growth in the coming years. The pric ethyl alcohol is revised and the BICP is already looking further revision required if any. The central excise levy molasses is adjustable under MODVAT on the central ex leviable on products made from the alcohol. Problems old, wrongly located plants do remain and require to be loo into from the point of view of viable production prospe The problems of inter-state transport of alcohol have to avoided by location of new projects in surplus molas alcohol areas and as far as possible integrated with alco production for captive use.

It is essential to bear in mind that production and in strial use of ethyl alcohol has to be treated as an integral of sugar production.

The prospects appear bright for a resurgence in ethyl al hol for chemicals in the Nineties in India.

Table - I

SUGARCANE PRODUCTION AND USE FOR SUGAR

Year	Area (in '000 Hes)	Yield/Hectare (tonnes)	Total cane crushed ('000 tonnes)	Sugar Production ('000 tonnes)	Molasses Productio ('000 tonne
1960-61	2413	45.7	31109	3028	1240
1970-71	2615	48.3	38204	3740	1620
1975-76	2762	50.9	41849	4261	1702
1981-82	3192	57.5	87330	8436	3832

Table - II
SUGARCANE USAGE %

	For Sugar	For seed, feed etc.	For gur & khandsari
1	28.2	12.5	59.4
71	30.2	12.0	57.8
81	34.5	11.7	54.0

Table - III
SUGAR PRODUCTION
('000 tonnes)

	70-71	75-76	81-82
ra	267	326	546
r	293	177	344
rat	84	115	531
rashtra	1055	1605	3026
ataka	205	361	647
l Nadu	299	182	756
	1299	1164	2080
India	**3740**	**4262**	**8435**

Table - IV
MOLASSES PRODUCTION & USAGE
(in '000 tonnes)

		For Alcohol	For Others	Total Use
37	37716	27191	5200	32561
33	41970	25696	8700	35359

Table - V
ALCOHOL PRODUCTION & USAGE
(in Kilo Litres)

	Prodn.	Potable	Industrial	Others	Total
87	6162	3205	2282	188	5674
88	6362	3432	2627	329	6388

Table - VI
CHEMICALS FROM ETHYL ALCOHOL

Item	Total Capacity (tonnes)	Alcohol required (m. ltrs.)
A. Presently operating plants		
1. Acetaldehyde and acetic acid including vinyl acetate and acetic anhydride	120,000 (as acetic acid)	170
2. Acetaldehyde for n-butanol pyridine, pentaerythritol etc.	20,000 (as acetaldehyde)	32
3. Ethyl acetate, diethyl oxalate and other esters	8,000	8
4. Styrene	30,000	24
5. Butadiene	22,000 (idle)	?
6. Vinyl chloride for PVC	14,000	15
7. Ethylene Glycol	20,000	30
		379
B. Programmes approved with alcohol assurance (8th Plan)		
8. Acetaldehyde for acetic acid vinyl acetate, etc.	30,000	50
9. Acetaldehyde for n-butanol, and others	15,000	23
10. Acetaldehyde for 2-ethyl hexanol	25,000	75
11. Ethylene glycol	30,000	50
12. Ethyl benzene & styrene	75,000 (as ethyl benzene)	60
		258
C. New Programmes that could be taken up in 1994-2000		
13. Acetic acid for PTA and new VAM projects	40,000	50
14. 2-Ethyl hexanol and n-butanol	30,000	90
15. Ethylene oxide for amines, ethers, condensates, etc.	15,000 (as ethylene)	30
16. Ethyl benzene and styrene	30,000 (as styrene)	24
17. Acetic acid additional	20,000	25
18. Expansion of present plants where feasible		75
19. New products such as propionic acid etc.		30
		324

The overall usage is 950 to 1000 million litres a year by 1999-2000.

Table

PERSPECTIVE PLAN FOR ALCOHOL-BASED CHEMICALS AS PER DR. BHATTACHARYA RE

Product	Estimated demand 1985-86 (Tonnes)	Requirement of alcohol (KL)	Estimated demand 1990-91 (Tonnes)	Requir of alc (KL
2-Ethyl Hexanol	37,000	122,100	67,000	221,1
Acetic	55,000	77,000	80,000	112,0
VAM	23,000	47,000	34,000	69,
Acetone	58,000	98,000	36,000	145,0
N-Butanol	11,000	20,900	15,000	28,5
Ethylene Oxide	16,500	36,300	25,000	55,0
Ethylene Glycol (lower level)	63,000	115,600	80,000	141,6
SBR	56,000	201,600	93,000	306,9
Styrene	62,000	57,000	90,000	82,8
Total Alcohol		775,500		1,163,8

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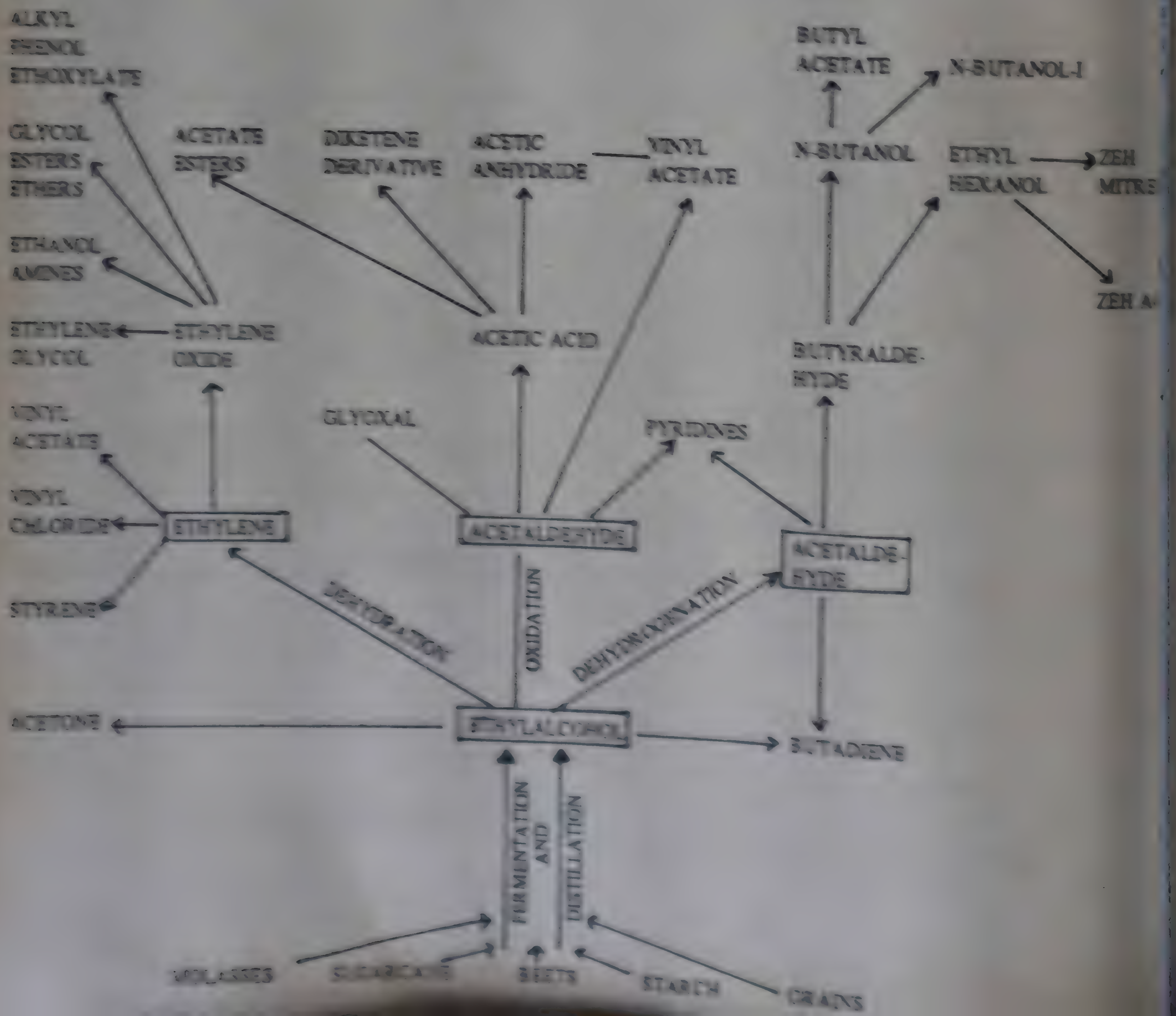
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VINYL ACETATE
ACETIC ACID
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lled FK506, in liver and
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were "impressive".

their work in the British
nal "Lancet", "the scient-
University of Pittsburgh,
a, said the drug was
free of unwanted side

nosuppressant called cyclo-
been widely used in organ
ver the past decade, but its
other limitations have com-
rs to continue the search for
osuppressants.

chemical produced by the
treptomyces tsukubaensis",
ered in Japan in 1984 during
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ce then it has shown encou-
ts in a series of animal tests.

archers said the agent was
n to patients in desperate
se their liver grafts were
ted despite conventional
ression.

n to 14 liver recipients for
pression. Ten of these
der conventional immuno-
had shown rejection, toxic-
Two of the 14 also received
d a third patient received a
pancreas in addition to the

There were no rejections of the kidney and pancreas grafts and serious side effects were not encountered, the scientists said in their report.

CANCER THERAPY THROUGH INSULIN WITHDRAWAL

Insulin in the treatment of tumours now seems a distinct possibility. According to the journal "German Research", scientists engaged in a research project in West Germany have been investigating the suitability of diazoxide for inducing diabetes for tumour therapy purposes.

Diazoxide is a drug which lowers the insulin level, and which is thus used to treat pathological insulin overproduction.

In the first animal experiment using this substance, the greater the dose of diazoxide, the more marked was the reduction in size achieved in two different breast carcinomas in rats, the journal said.

As with any other hormone therapy, tumour growth eventually restarted despite continuation of the diazoxide treatment, it said.

This renewed tumour growth is due to the fact that malignant tumours adapt to changed hormonal condition at any given time. However, if the diazoxide was withdrawn after the reappearance of the tumours, some 30 percent of them receeded for a second time, the journal said.

To effect this withdrawal, insulin could be used thereby providing proof of the insulin-induced effect of diazoxide.

A WHIFF OF FRESH AIR

The clean, wholesome smell of fresh air may soon be sold in small perfume bottles for about five dollars apiece in the United States. Scientists in New Jersey have virtually unlocked the key to developing a chemical with an aesthetically pleasing "aroma" of fresh air. Dr. Braja D. Mookherjee, a researcher from International Flavours and Fragrances (IFF), New Jersey, told the 11th International Congress of Essential Oils, Fragances and Flavours in Delhi.

The breathtaking development is of special significance to industrialists trying to manufacture laundry detergents, fabric softeners and air fresheners with a "unique, exciting outdoor fragrance", Dr. Mookerjee said.

Scientists at IFF have found that a mixture of organic compounds called aldehydes in a particular proportion is responsible for the fresh air aroma of cotton clothes that have been dried in sunlight and air.

The IFF team tried to analyse systematically why cotton clothes dried outdoors have a pleasing smell, reminiscent of aldehydes and ozone while of machine-dried cotton clothes have an unpeasant smell of burning matchsticks or scorched paper.

It performed a series of experiments to analyse the volatile compounds present in clothes that have been washed in cold water and dried either outdoors in sunlight or indoors with drying machine.

For chemical analysis, the clothes were purged in a slow stream of nitrogen at room temperature in a special glass apparatus for two days. And the volatile chemicals were trapped and analysed by gas chromatography and mass spectroscopy methods.

The scientists found a series of saturated aldehyes, each with six to 15 carbon atoms. Further tests showed that air does not contain these aromatic compounds.

Also, sun-dried cotton clothes alone appeared to have pleasant smell. Polyester and nylon clothes, when dried in fresh air and sunlight, did not produce the desired aromatic molecules and instead, had a dusty smell, almost like that of newly-manufactured cloth.

Cotton possesses saturated higher fatty acids which are oxidised in the presence of sunlight and a photosensitising agent to form the aldehydes that are responsible for the pleasant smell Dr. Mookherjee explained. Cotton cloth contains a chemical additive used as a sizing agent which is known to be a photo sensitiser.

The predominant constituents of the washed and sun-and-air dried nylon clothes are unknown silicone molecules along with a small quantity of aliphatic aldehydes (molecules where all carbon atoms are linked in a straight chain). Polyester cloth contains trace amounts of aldehydes and aromatic compounds like benzaldehyde and naphthalene.

Machine-dried cotton cloth contains only the fatty acids and an anti-oxidant called ionol. But, when the same cloth is washed in cold water and dried in the sun a series of aldehydes responsible for the fresh-air aroma are seen, confirming that light is necessary to catalyse the oxidation of fatty acids to aldehydes.

Saturated aldehydes have been used by perfume manufacturers for several years. The IFF finding has invoked considerable interest in several European and U.S companies which are planning to develop fresh air fragrance for laundry soaps and air-freshners.

BIODECOMPOSABLE POLYMER FOR SLOW RELEASE DRUGS

A biodecomposable polymer has been developed in Japan. The new polymer which is suitable as a slow release drug carrier has been developed by Japan Atomic Energy Research Institute. Prof. H. Yamanka of Gunma University and Taki Chemicals Company Ltd., according to the journal "Techno Japan".

The polymer releases the drug during one to 50 weeks and is finally decomposed. It is not harmful to the human body and has a controllable release time, the journal said.

It is composed of an oxyacid and lactone compound which undergo a dehydration condensation reaction. No radioactive irradiation polymerisation is required. The medicine is mixed in the compound as a paste and agitated, it said.

This process can prepare a slow release drug when the solid polymer is mixed with the drug so that a solid drug to be buried in body is prepared.

As the polymer contains no catalyst and no solvent it is not harmful to the human body. Release rate is controlled by control of the molecular weight of the polymer, the journal said.

NEW MANUFACTURING PROCESS OF FIRE RETARDANT FOR FIBRE

A new manufacturing technology for "phosphagen fire retardant" which makes cellulose fibres such as cotton fire retardant has been developed in Japan. Phosphagen fire retardant is a highly safe agent for sheets, pyjamas and underwear. However, conventionally it has taken 50 hours for the chemical reaction during production and the yield has been low, the journal "Techno Japan" said.

The new process takes 5-6 hours for reaction which is about a tenth of the existing process and the yield is greater, the journal said.

Conventional fire retardants have been made from formalin. But the formalin residue in textile causes a reaction in allergic people. Therefore, non-formalin type phosphag fire re
has appeared. No problem from
malin residue occurs with phos
and it can be used safely for c
wear by those prone to allergy,

The new technology manuf
phosphagen fire retardant in a sh
and with a good yield by the r
between cholorphosphagen and a
ium under pressure. Fire proof
phosphagen can be cheap, whi
lead to its widespread intro
rapidly, Techno Japan said.

LOW AREAS SAFE FROM GREENHOUSE EFFECT

The low-lying areas of the wor
Bangladesh and coastal area
Bombay and Madras will be saf
the Greenhouse Effect, which
comes, will heat up the northern
sphere more dramatically tha
southern hemisphere, a report in
says.

The Greenhouse Effect woul
lead to a cooling of the Antarctica
result being that there would be
in sea levels, the United States N
Oceanic and Atmospheric Admi
tion said in the Nature report.

"If the Antarctic ice sheets
melt, the doom and gloom pred
of extreme sealevel rise ma
occur," the NOAA said.

According to NOAA's
computer simulation, the averag
face air temperature in North A
will be between three and seven d
Fahrenheit warmer by the year 20
year when the computer mo l's
dioxide level reaches twice that o
However, regions such as the s
ocean and Antarctica will be co
seven degrees in some places.

NOAA cautioned that the est
are extremely imprecise and
numbers should not be taken to
ously".

RULING ENDANGERS
N BIOTECH INDUSTRY

ecision by the Hesse state
court ordering Hoechst to stop
its DM70m (37.8m) test com-
genetically engineered human
t Frankfurt, could have reper-
for other recombinant DNA
and production projects
out West Germany.

court's view, state authorities
ave a legal basis for granting
to operate plants working with
nant DNA, as parliament has
ed a comprehensive law setting
recise rules for companies to
The court also said that the fed-
ssions control law, under which
are currently judged, is inad-

lower house of parliament, the
tag, was to open debate on a bill
tic engineering drawn up by the
ministry and passed by the cab-
t rejected by a major part of the
ouse. Final passage by the Bun-
is expected by late 1990 at the

ting to criticism of the first draft,
binet in its revised version has
ted the mandatory public hearing
nts in all four defined risk cat-

e other genetic engineering pro-
urrently in the approval pipeline
affected by the Hesse court's
, although two are in other

state environment ministry in
which indirectly triggered the
decision by approving the
t project despite massive public
tion, said it does not see a legal
or approving plans by Hoechst's
iary Behringwerke to build a
o manufacture erythropoetin from
ulated mouse cells at Marbarg.

Grunenthal's plans to build a DM40m plant to produce the blood clot dissolver pre-urokinase from E coli bacteria at Aachen, and an application by BASF's subsidiary Knoll to manufacture the anti-cancer drug tumour necrosis factor at Ludwigshafen, could also be affected by the ruling.

If the Knoll project is not approved by the end of 1990, chairman Hans-Jurgen Quadbeck-Seeger has said his firm will consider having the drug produced outside West Germany. A BASF spokesman said the group is "dismayed" by the ruling.

An inter-ministerial committee has been established in Bonn to study prospects for having new genetic engineering plants approved during the period before passage of the framework law.

Meanwhile, US drugmaker Eli Lilly, one of Hoechst's major competitors in the insulin market, has announced plans to build a second plant to produce its genetically engineered human insulin at Feggershelm, near Strasbourg, just across the border from West Germany. Start up is scheduled for 1993.

DRUG APPROVAL DELAYS "UNLAWFUL"

An administrative court in West Berlin has ruled that the federal health authority, the Bundesgesundheitsamt (BGA), must decide on applications for registration of new drugs within four to seven months, as stipulated by law.

The decision was made in the first of 14 suits filed by pharmaceutical manufacturers. The BGA has filed an appeal against the ruling, which could become a precedent for the remaining 13 cases. Drug makers are facing unusually long delays in having new products approved in West Germany, with estimates of the backlog ranging from 8,000 to 11,000 applications, and approval taking more than two years.

The West Berlin court rejected the BGA's argument that delays could be expected because of the large number of applications for which approval is required under amended pharmaceutical statutes. The court said German drug law gives pharmaceutical companies a "subjective right" to have registration applications approved if all legal requirements have been fulfilled. It blamed the federal government for failing to provide the BGA with the means to fulfil its legal obligations.

The drug company, Frankfurt-based Hormosan-Kwizda, says it will now sue the BGA for profits lost over a one-year period. Application for approval of its infusion liquid Vasomed, an arteriosclerosis drug with the active ingreditent pentoxyphyllin, was filed in March 1988. However, the problem is not confined to West Germany. The time taken by the UK department of health to grant approval is taking up to 12 months longer than it did five years ago.

Statistics compiled by the UK's major pharmaceutical companies show that approval now takes 21 months for new drug and 26 months for new formulations of existing products. The EC recommends a 210 day maximum for drug approval. The lengthening delay is leading to demands for increased patent lives; the time taken for development, testing, and approval reduces the 20-year life by an average of 13 years.

CHIRON LICENSES VIRAL DIAGNOSTICS

California-based Chiron Corp is to collaborate with Japan's Daiichi Pure Chemicals to develop a range of viral infection diagnostics for markets in Japan and Taiwan.

Chiron will receive up to $20m over five years for the licence of its DNA probe technology, as well as research funding for product development and royalties from product sales by Daiichi.

The agreement covers development of diagnostics for the hepatitis A,B and C viruses and human immunodeficiency virus (HIV). Commercialization of products is expected to lead to the formation of a joint venture between the two companies in Japan.

The agreement may be extended to other Asian countries, but Chiron retains technology rights for the rest of the world. In the US, Chiron has a separate partnership agreement with Ortho Diagnostic Systems to commercialize a series of immunodiagnostic products for hepatitis and Aids.

ENZYME FILM MAKES JAPAN BID

Imperial Biotechnology, through its Australian parent Burns Philip, has launched a bid to become a major supplier of food-grade enzymes in the Japanese market.

Burns Philip, which acquired Imperial Biotechnology in May this year, has agreed in principle to supply Japan's Banpoh Trading Co. with three of the UK company's core products; accelerase, savorase and debitrase.

The enzymes are used in the degradation of proteins. Acccelerase can reduce the curing time for cheese curd; and debitrase is used in the process for non-bitter hydrolysates. These products faciliate the development of low-fat milk products and natural flavourings.

R-P FORMS CANCER DRUG JV WITH CHUGAI

Rhone-Poulenc Sante and Japan's Chugai Pharmaceutical have reached an agreement in principle to form a 45:55 joint venture for the development in Europe of Chugai's granulocyte colony stimulating factor (G-CSF).

G-CSF has wide potential in treating cancer and Aids. It is in clinical trials in Japan and Europe, and the two firms believe it warrants accelerated examination by registration authorities.

In a separate move, Chugai is to acquire Gen-Probe, the US biotech concern, for around $110m. Gen-Probe signed an agreement last year for Chugai to market its cancer diagnostic products in Japan.

FOOD WASTE OFFERS ROUTE TO BIODEGRADABLE PLASTIC

Ambitious plans to turn potato peel into degradable plastics are being pursued in the US.

Scientists at Argonne National Laboratory, Illinois, have developed technology to convert high carbohydrate food wastes, such as potato peel and cheese whey permeate, into polymer-grade lactic acid. Lactic acid polymers are being designed that are stronger and exhibit enhanced bio and photodegradability over other degradable plastics, project leader Robert Coleman said.

First target for the polymers is the agricultural market, where low molecular weight polylactates are seen to hold promise as sustained release systems for fertilizers and pesticides.

In the new process, more than 90 per cent of the starch in potato wastes is enzymatically hydrolyzed to glucose, the glycose continuously fermented to lactic acid, and the lactic acid recovered, concentrated and purified. Bioconversion of potato starch to glucose takes place in as little as 10 hours, one-tenth that of conventional technology. Lactic acid is produced in 95 per cent yield in under 48 hours. Work is continuing to improve the economics and versatility of lactic acid polymerization.

Meanwhile, Argonne is collaborating with the US National Fertilizer Development Center in Tennessee to test the use of polylactates for the sustained release of urea-based fertilizers. Field trials are set to begin soon.

Further industrial support or partic pation is sought to help scale-up lact acid production and to test and mark the biodegradable polylactates.

"In the US around 10bn pounds/yea (4.53m ton/year) of potato waste is discarded or sold as cattle feed for as littl as $3/ton", says Coleman. "A proces for bioconverting high carbohydra food waste to lactic acid will not onl help solve a waste problem of the foo industry but should stimulate the development of lactic acid as a commodit compound for use in degradable plastics."

The market for degradable plastics i projected to grow at 75 per cent/yea from 1987 to 1992; for degradable film the projected growth rate is 146 pe cent/year.

MOBILE PESTICIDE CURE

A new technique to decontaminate pesticide waste water produced in agricultural communities is being developed by the US department of agriculture (USDA) and Ciba-Geigy Corp. The aim is to develop a portable method of destroying pesticides in water such as those used in spraying equipment.

The treatment uses a combination of chemical and biological attack. The waste water is first oxidized in a tank, by the introduction of ozone, followed by percolating through a soil bed innoculated with Pseudomonas A.

The bacteria, which is naturally occurring, was discovered and patented by Ciba-Geigy and breaks the otherwise resilient ring structures found in most pesticides. The byproducts of the process are ammonia and urea, which if discharged, are converted by soil bacteria into nitrogenous compounds.

USDA research leader, Dr. Cathleen Somich, said the goal of the work now was extend the scope of the process of commercial pesticides.

News about new projects

OHN BROWN FOR EXXON/-HELL FRENCH LLDPE JV

Exxon Chemical and Shell Chimie are definitely going ahead with a joint venture to produce linear low density polyethylene (lldPE) in France. John Brown Engineers & Constructor is already working on detailed engineering and procurement from the project and seems well placed to pick up the contracting role. Plans, first announced earlier this year, entail a 220,000 ton/-year unit at Notre-Dame-de-Gravenchon, Normandy, and represent an investment of FF1bn ($170m). Start-up is scheduled for the third quarter of 1991.

Based on Unipol gas-phase technology, the plant will be able to produce high density polyethylene (hdPE) as well as lldPE. It will be owned by a Groupement d'Interet Economique (GIE), to be called Compagnie Industrielle des Polyethylenes de Normandie (CIPEN), in which Shell and Exxon will have an equal 50:50 share. The plant will be managed by a subsidiary of Societe Francaise Exxon Chemical, set up for the purpose, called Exxon Polymeres.

A contractor will be appointed by the year end, says an Exxon spokesman. Three or four companies with experience in this area are being evaluated, specifically in terms of cost, quality of service and timing. John Brown would seem to stand a good chance.

Ethylene feedstock will be sourced from Exxon Chemical's adjacent 320,000 ton/year steam cracker. In return Shell Nederland Chemie will supply ethylene from its Moerdijk site to Exxon's 250,000 ton/year ldPE plant at Antwerp. Under the terms of the deal the partners have equal duties to supply ethylene and rights to withdraw products of their own specification. Each will undertake marketing and product development separately.

Both companies see lldPE as the fastest growing segment of the European PE business. "Low density polyethylenes, including both ldPE and lldPE, are set to grow at an overall rate of 3 per cent/year-mainly in the area of flexible packaging applications. Within this category by far the most significant increase in demand will be for linear-low PE where we expect a 14 per cent/year growth rate," says Exxon Chemical's polymers marketing vice-president John Taylor.

For Shell the joint venture represents its first step into the lldPE scene. It has ldPE plants at Berre and Fos in France, and at Carrington in the UK, and both ldPE and hdPE in West Germany, (at ROW in association with BASF). Exxon has a joint venture (Kemya) with Sabic which produces lldPE in Saudi Arabia. An expansion of Exxon's Meerhourt ldPE plant from 260,000 to 365,000 ton/year is set to go on-stream by mid-1990. Shell and Exxon do not see a problem in working together. They have previously worked on the Mossmorran, UK, ethylene plant and in North Sea oil exploration and development.

SHELL PICKS KTI FOR DUTCH EB

KTI has been awarded a contract to design and construct a Df1.90m ($43.55m) ethylbenzene plant for Shell Nedereland Chemie at Moerdijk just a few months after Fluor Daniel won Shell Chemicals' Stanlow, UK, ethylbenzene project.

Like Stanlow, the 360,000 ton/year plant will use Badger/Mobil technology. KTI has responsibility for design, procurement, construction and preparations for start-up. Technical documentation and support to obtain the necessary permits will also be handled by KTI. Construction will start at the beginning of 1990, with start up scheduled for the

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Biotechnology

GLAXO EXPANDS IN SINGAPORE

Glaxo is to invest S$200m ($110.6m) in Singapore on new manufacturing and process development facilities to commercialize its latest drug formulations.

The first three compounds will be: Sumatriptan, a treatment for migraine; ondansetron, for controlling nausea; and salmeterol, a long-acting bronchodilator for asthma sufferers.

Product licence applications for ondansetron are currently being filed with regulatory authorities. Submissions for sumatriptan and salmeterol are planned for next year.

The new plant is to be located at Jurong, adjacent to Glaxo's existing manufacturing centre which produces the active ingredient for the ulcer drug Zantac. It will be operated under the management of a new company, Glaxo-chem Development (Pte). Completion is due in 1993.

MERCK SELLS VACCINE KNOW-HOW TO CHINA

Merck & Co. has agreed to sell the know-how to produce its genetically engineered hepatitis B vaccine to the People's Republic of China. Under the agreement, Merck will not manufacture or sell the vaccine in China, but will train Chinese engineers and technicians in the US over the next two years. Production facilities prefabricated in the US will then be shipped to China for reassembly. Merck expects the plants will eventually produce up to 40m. doses/-year of the vaccine.

Hepatitis B has been called China's "number one" health priority, with 180m. Chinese estimated to be carriers. By developing the capability to produce genetically engineered vaccine, China's ministry of public health plans to be able to provide protection for the 20m children born in the country each year.

AFEAS LL LAUNCHED

Eight chemical companies have agreed to form a research consortium, Afeas II, to address the environmental impact of seven promising CFC substitutes. The new grouping replaces the now disbanded Afeas (Alternative Fluorocarbon Environmental Acceptability Study), which completed its work with a report to the UN environment programme. Companies which have agreed to participate so far are: ICI, Atochem, Allied Signal, Du Pont, Montefluos, Hoechst, Kali Chemie and La Roche Chemical. They have invited other companies from the original 15-member Afeas group to continue research in depth.

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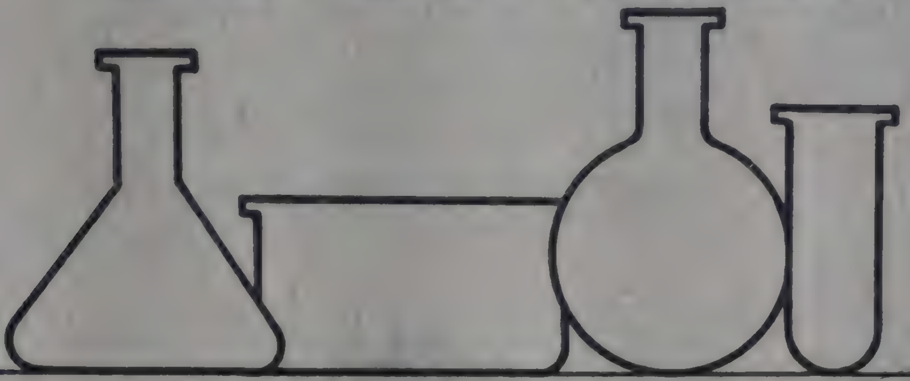

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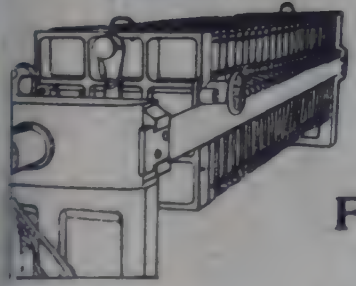

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iveness when used with processing of sheep skins, cattle
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ABSTRACTS

Amino acid analysis of leather — Preliminary studies in delineation, accelerated ageing and conservation of vegetable tanned leather, R. Larsen, V. Barkholt and K. Nielsen. *Das Leder*, **110**, (8), 113, 1989.

Delineated leather may be characterised by containing large amounts of ammonia and by an altered amino acid destruction compared to that of new leather. It is shown that proline and lysine are the two amino acids mostly affected by the delineation. These two amino acids together with isoleucine may, irrespective of the state of delineation, provide a static method to establish the animal origin of the leather. Attempts with accelerated ageing methods may lead to results similar to those found for historical leather.

The heterogenous interaction between sulpho-syntans and collagen part III: The leather fraction, Z. Vinblarek, M. Vondueska and J. Kapee, *J. Soc. Leath. Tech. Chem.*, *73*, 110, 1989.

The present study provides a theoretical analysis of the tannin fraction as a relative variable describing, qualitatively, the amount of sulpho-syntan oligoelectrolyte bonded under given conditions. Relationships making possible the calculation of the variable from values measured experimentally by gravimetric analysis, are derived on the basis of this theoretical analysis. Furthermore, a simple relationship for the determination of the variable by means of UV spectroscopy method was also derived.

Compressibility measurement and the objective assessment of softness of light leather, B. Lokanandan, V. Subramanian and R.C. Nayar, *J. Soc. Leath. Tech. Chem.*, **70**, 115, 1989.

A simple method is described for measuring numerically the softness of leathers based on compressibility. This method could be valued in the assessment of the quality of leather objectivity and semi quantitatively. It is non-destructive and time saving. Each leathers having marginal differences in the degree of softness can be differentiated with the help of Compression Index. Further work to establish confidence limits by increasing the sample size is in progress with a view to developing a quantitative measure of the softness of light leathers in terms of CI.

Permanently soft leathers, E. Heidemann and T. Plihas, *Das Leder*, 40 (3), 1989.

The authors claim to produce leather which retain ness permanently by shifting neutralised chrome leath about 20% of natural fat, keeping it in a hot air (50°C for three hours and then extracting it with methylene ride. It is suggested that a residual 1-2% of fat can be re by treatment with butanol/ammonia. The term perm softness is defined as the leather being soft, after soak water and drying freely suspended.

The effect of sodium chloride in anaerobic digestion Jackson Moss, J.R. Donean and D.K. Cooner, *J. Am.* *Chem. Assoc.*, **84**, 266, 1989.

The ability of anaerobic microbial populations to ac high sodium chloride concentration was investigated. focussed that a sodium chloride concentration of upto 1 mg/l had no inhibitory effects on the anaerobic digestio cess. There were no notable differences in digestion per ance relative to a control with the exception of an inc in the methane content of the biogas. These results su therefore, that the concentration of NaCl present in ta waste waters, which ranges from 2500 to 12500 mg/l have no significant effect on an acclimatised anaerobi estor treating these wastes.

High efficiency chrome tannage, R.F. Waud, *The Le* **101**, (6), 24, 1989.

This paper describes an improvement in chrome ta from exhaust liquors and in the fixation of chrome to the This development is of critical importance to the ind trying to match and look ahead to future environmenta islation.

Amino chemicals: Functional finishes for the leather i try. Marty Curie, *The Leather Manufacturer*, 107 (7) 9.

Fluorochemicals can provide tanners with unique pe mance alterations to standard leather finishes, creating l ers which are easy to care for, resist stains and look t tiful. They can provide a predictable effect in oil and repellancy. The benefit to the tannery can be found i sumer awareness, consumer confidence, consumer sat tion, competitive advantage and an extra margin of

INDIAN LEATHER SCENE

NNERS GET-TOGETHER 1990

n Tanners' Get-Together (TGT-1990) to be held tral Leather Research Institute (CLRI), Adyar, ring January 28-30, 1990 is now announced. Con- the visionary late Prof. Nayudamma in 1966, the f Tanners' Get-Together has reached new dimen- his Silver Jubilee Year.

T-1990 is being jointly sponsored by the Central esearch Institute (CLRI), Council for Leather LE), All India Skin and Hide Tanners and Mer- sociation (AISHTMA), Indian Leather Technolo- ciation (ILTA) and the Committee on Science and gy in Developing Countries (COSTED). This rep- andmark where the Government, the Industry and rch Institute have sought a consensus to plan the n of Indian leather sector, especially during its ase in the Nineties.

nscious choice of the theme for the 25th TGT is ives, Policies and Plans for the Leather Industry in — A Consensus'. The theme will be discussed in sions. It is hoped that tangible recommendations the outcome of this TGT. Speakers from the Gov- he industry and technical bodies in India and abroad invited. Active discussion, poster presentations and demonstrations are also planned.

n I: **Perspectives and policies.** This session will subjects viz. Government policies. Industries' per- and R & D perspectives for the next decade. Ses- **roblems and plans.** This session aims to bring into various problems and seek consensus on the plans t decade on: Resource management, environment and marketing management. A structured panel among experts on leather and products is planned. : **Targets and technologies.** Challenges in meet- port targets and technological options of the Nine- focussed in this session. The technical discussion n: Biotechnologies, chemical/process technologies, echnologies and modernisation concepts and con-

al sessions

chnical programme will include invited lectures on specified topics and contributed papers in the form of posters relating to the main theme of the 25th Tanners' Get-Together. Participants submitting papers for poster session are requested to send an abstract of the paper in 200 words. Invited speakers are requested to send the text of the main paper in advance.

Practical demonstrations

Participants including commercial manufacturers are invited to hold practical demonstrations of newer methods of leather processing. Newer materials for leather products can also be exhibited. The necessary facilities will be provided. Requests for holding demonstrations/exhibitions should be accompanied by a short write-up of about 200 words on the process/item.

Pre-registration

Participants need to pay a delegate fee of Rs. 250 (or US $25) per person in the form of crossed Demand Draft in favour of the Conveners, 25th Tanners Get-Together, CLRI, Madras, drawn on State Bank of India, Adyar, Madras, India. Abstracts and requests for demonstration should be sent before 15th Jan. 1990. For further details contact: The Conveners, 25th Tanners Get-Together 1990, Central Leather Research Institute, Adyar, Madras 600 020.

LEATHER UNITS TO SEEK SOFT LOAN

In view of the change of guards in New Delhi, the Indian Leather Technologist Association (ILTA) would make a fresh move for soft loan for technological upgradation and modernisation of the leather industry on the line of the jute industry modernisation scheme. Mr. Sanjay Sen, leather technologist and ILTA president, has taken the lead in that direction and would soon be approaching the new Prime Minister, Mr. V.P. Singh, and impress upon him for such soft term loan if the country is to attain the Eighth Plan production target of over Rs. 7,800 crores by 1994-95.

Addressing newsmen on the eve of Expo '89, Mr. Sen said that the working group set up by the previous government estimated that about Rs. 900 crores would be required for the leather industry to develop infrastructure during the Eighth Plan. Of this the foreign exchange component would be of the order of Rs. 750 crores. He is of the view that if like jute industry, leather industry was also given soft loan with highly concessional rate and fairly long span of repayment, the industry would be able to expand and grow on the expected

In view of the shortage of raw materials, the ILTA president emphasised the need for manufacturing more value-added items for the export markets and on the other hand to use pure leather alternatives. This use would open a new vista to the leather industry, he added. So far as the Indian leather industry is concerned, Mr. Sen pointed out that the most disturbing factor is the availability of the basic material, raw hides. It is estimated that there would be gap between 70-100 million square feet of leather in the beginning of the Eighth Plan and 200-250 million square feet at the end of the Plan.

During the Seventh Plan period the leather industry has registered a significant growth thus the value of output has gone up from Rs. 1670 crores in 1984-85 to Rs. 1,800 crores in 1989-90. The annual rate of growth during the current Plan period is 28 per cent. The export has steadily gone up to Rs. 1,800 crores which in the next Plan period is estimated to touch Rs. 3,500 crores. Leather ranked fourth among commodity exports from India. The total licensed capacity up to the Seventh Plan envisages 63 million pairs of leather footwear, 53 million pairs of shoe uppers and five lakh pieces of leather garment. It has been estimated that during the Seventh Plan over Rs. 250 crores of investment would be made in the leather manufacturers sector. It has been estimated that during the Eighth Plan an additional capacity of 240 million square feet of finished leather, 24 million pairs of shoe uppers, 1.25 million pieces of garments and 29 million pieces of leather goods needed to be set up with an investment of about Rs. 900 crores of which foreign exchange component would be Rs. 750 crores.

SEMI-PROCESSED LEATHER: CEILING FOR EXPORT FIXED

The Commerce Ministry has decided that export of semi-processed leather will be allowed within a ceiling of 18,79,625 pieces during October, 1989 to March 1990, including the unutilised 3,95,125 pieces left with the Joint Chief Controller of Imports and Exports. Calcutta. According to a public notice issued by the chief controller of imports and exports (CCI and E) on November 17, the ceiling will comprise 9,74,375 pieces of semi-finished EI tanned (buff calf 1,22,250, cow calf 1,04,375, cow hide 1,10,625, buff hide 6,875, sheep skin 2,81,500 and goat skin 3,48,750 and 9,05,250 pieces of wet blue goat skin (including 3,95,125 pieces unutilised from the first half year of 1989-90).

It has been decided that in respect of EI tanned (buff calf, cow calf, cow hide, buff hide, sheep skin and goat skin), the ceiling will now be monitored by the Joint CCI and E, Madras and in respect of wet blue goat skin, the Joint CCI and E, Calcutta. Intending exporters may submit complete applications to the above mentioned licensing authorities. Separate applications may be submitted for separate items. Applications should be sent to the Joint CCI and E within 30 d from the date of issue of this public notice (November 1 The licensing authorities will consider the applications on basis of highest unit value sought to be realised and as quo in the applications. The unit of measure shall be on the b of a lot of 100 pieces of irregular sizes to be quoted in Rup f.o.b. for 100 pieces. No applicant will ordinarily be gran export licence for more than 10 per cent of the available c ing in each category. In case, the ceiling is utilised, the procedure for calling for further applications be repeated as laid down in the export policy.

The licensing authorities will intimate to the exporter t he has been allotted a ceiling and the exporter shall be giv 10 days from the date of issue of ceiling to furnish a ba guarantee. It shall be one per cent of the f.o.b. value of ceiling allotted. On exporters furnishing the requisite ba guarantee, the licensing authority shall issue an export licen for the ceiling allotted and indicate in the export licence f.o.b. value at which the exporter had agreed to export as furnished in the application. The export licence shall valid for six months, it has been stated.

GROWING MARKET FOR LEATHER IN EC

Tremendous opportunities exist for footwear exports to t European Economic Community, particularly West German according to a paper presented at a seminar in Madras "Marketing of leather footwear in the US and European cou tries". The paper said the footwear industry in India had ju stepped out of its infancy and was mainly cottage oriente India's leather industry had succeeded in raising its mark share from nothing in the early eighties to just over three p cent now, but a lot could be done to get a higher cut. We Germany, which accounted for Rs. 252.3 crores of India total leather and leather goods export of Rs. 1,618.73 crore had been identified as a growing market. Statistics show German manufacturers were able to meet only 24 per ce of their country's shoe requirements, but the Indian share what they imported was hardly one per cent. In his pres dential address, Mr. M.M. Hashim, chairman, Council f Leather Exports (CLE), said the Indian performance in US and West Germany, the two largest importers of footwe in the world today, had not been very happy. He said com petition in the world market had become so tough that ne exporting countries were forced to offer footwear at a ver low price. Moreover, in some countries unlike in India, the was constant research and development going on and the was constant research and development going on and l cost items.

Earlier, welcoming the gathering, Mr. A. Sahasranama executive director, CLE, said the council had been organi ing a series of seminars which were "product specific" an et specific" and would focus on the numerous pro- the industry was facing to find possible solutions. Mr. que Ahmed, president of Indian Finished Leather Manu- ers and Exporters Association who inaugurated the sem- uggested abolition of excise duty on components for nd leather goods industry as excise duty was a disin- e for manufacture of components. He also suggested tting duty free import, initially, for various materials red for manufacture of the components.

THER EXPORTS: PROCEDURE DELAYS, AIR CE SHORTAGE E. REGION'S WOES

ocedural delays and lack of air space are nullifying ts to increase leather goods export from the eastern n. With air being the only mode of transport for leather ucts, Calcutta has been placed at a disadvantage com- l to other metros. Lack of air space, exporters pointed was forcing them to carry large inventories. As a result lays buyers were forced to cancel orders. Besides, sub- ial raw material was also being diverted to other regions e exporters were better placed to execute orders. Mr. Zafar Ali, chairman of Council for Leather Exports tern region) mentioned that around Rs. 4 crores worth ather exports were held up at Calcutta due to non- ability of air space. Mr. Ali was speaking to reporters a CLE seminar at Calcutta on December 15, on export edure and documentation. Mr. Ali informed that CLE arranged special freight service from January 1, 1989, llaboration with Air-India. While 15 tonnes of additional ht has been allotted to Calcutta, Delhi and Bombay every , Madras has been allotted 30 tonnes per week. Against normal freight charge of Rs. 23.90 per kg, the special ht will attract a tariff of Rs. 38.90.

he additional charge does not seem to bother exporters, N. Kalwani, director, Ajanta Leather, said his company was willing to pay upto Rs. 50 per kg if timely space was available. The company presently has over Rs. 40 lakhs of leather goods awaiting transport. Another major bottleneck cited by exporters was procedural delays. Exporters complained that hold-ups at the office of Joint Chief Controller of Imports and Exports (JCCI and E) was costing industry dearly. In fact, a major consignment of chrome-tan goat skins, valued at Rs. 2 crores, is presently hanging fire. With the JCCI and E taking up to eight weeks to process applications and issue the necessary licence, the concerned exporters are now facing a possible cancellation. Exporters, therefore, urged JCCI and E to set a time limit for dealing with all procedural matters.

Leather goods exports from the eastern region has been picking up of late. From total exports of Rs. 102.32 crores in 1984-85, the figure jumped to Rs. 229.69 crores in 1988-89 and is expected to touch Rs. 275 crores in the current year. The number of exporting firms have also increased. The number of exporters registered during the current year increased to 530 compared to 398 in 1988-89. However, the region's share in all-India export has been dismal. From accounting for 17.53 per cent of total exports in 1984-85, the figure actually declined to 13.04 per cent in 1988-89. Earlier at the seminar, JCCI and E, Calcutta, Mr. C.K. Sridhar, said his office was extending all co-operation to exporters and was open to suggestions for streamlining procedures. However, Mr. Sridhar advised entrepreneurs to keep abreast of policy changes to facilitate better co-ordination. He urged CLE to prepare and distribute a paper on how to overcome common problems faced by exporters. Mr. Om P. Dhamija, additional director of Export Inspection Agency, stressed on the need to give adequate thrust to the leather sector which had emerged as one of the major sources of foreign revenue. Mr. Dhamija mentioned in this regard that from a net exporter of leather hides, the country was now heading for a situation where it may fall short of raw materials.

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STATISTICS

Trends in UK dressed leather production

Type of leather	1970s average	1984	1985	1986	198
Footwear uppers & lining million ft²	184.2	80.3	73.5	70.6	70.
Footwear bottom 1000 tonnes	3.8	3.8	2.6	2.4	2.
Garments & gloves million ft²	119.0	96.5	90.9	87.2	86.
Upholstery, million ft²	25.0	35.7	36.2	40.1	12.
Chamois, million ft²	23.0	23.2	23.4	22.7	25.
Shearing million skins	2.8	1.5	1.4	1.7	1.9
Industrial 1000 tonnes	1.3	0.6	0.7	0.5	0.6
Others, million ft²	37.0	20.2	15.3	13.3	18.7
Total as million ft² equivalent	397.0	272.0	253.0	249.0	270.

UK Livestock population and slaughterings (million)

Year	Cattle & calf			Sheep & l
	Population as on June	Slaughter		Population as on June
		Ox & cow	Calf	
1980	13.4	4.1	0.1	31.4
1984	13.2	4.3	0.1	34.8
1985	12.9	4.1	0.1	35.6
1986	12.5	3.8	0.1	37.0
1987	12.2	4.0	0.1	38.8
1988	11.9	3.3	0.0	40.9

UK trade in raw hides & skins (all types)

Year	Imports		Exports
	1000 tonnes	£ million	1000 tonnes
1980	48.2	39.5	98.2
1984	55.4	73.5	117.3
1986	60.4	90.7	121.3
1987	68.5	110.3	112.8
1988	77.2	90.7	94.7

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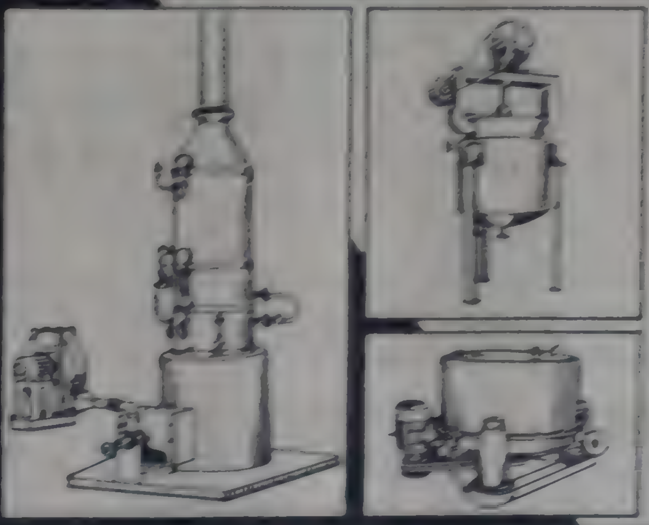

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sale)	70.00
ate	6.00
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Butyl carbitol	110.00
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Trichloroethylene	29.00
Triethanolamine (Resale)	71.00
Turpentine Oil (Germany)	8.00
Turkey Red Oil (50%)	20.00
Vinyl Acetate Monomer	47.50

SOLVENTS	Per Litre
Benzene	10.80
N-Heptane	10.50
N-Hexane	13.00
Methanol	9.50
Solvent Naphtha Heavy	10.50
Solvent Naphtha Light	8.50
Toluene	13.50
Xylene	18.00

DYES INTERMEDIATES (PRICES ARE WITHOUT TAX AND EXCISE)

Alphanaphthylamine	63.00
Alpha Naphthol (Imp.)	165.00
Aceto Acetic Ester (Methyl)	64.00
Ammonium Molybdate	210.00
Anthraquinone	115.00
Anthranilic Acid	77.00
2 Amino 4-Nitrophenol	140.00
Blue B. Base (Local)	255.00
Beta Naphthol (Atul)	72.00
Benzidine Dihydrochloride (BDH)	96.00
Bromamine Acid	600.00
BON Acid	130+Ex+Ta
Chicago Acid (Atul)	345.00
Coach Acid	55.00
C. Acid (Imp.)	210.00
Cyanuric Chloride	128.00
2.4- DNCB	30.00
Dihydrothio PTOS (Imp.)	1,000.00
Dimethyl Aniline	70.00
Diethyl Aniline	165.00
Diamino stilbene disulphonic acid	165.00
3.3-DCB (Imp.)	180.00
Gamma Acid (Atul)	200.00
H. Acid (Atul)	120.00
G. Salt	75.00
Isophthalic Acid	45.00
J. Acid	355.00
J. Acid Urea	425.00
K. Acid	125.00
MPDS (German)	185.00

Meta Chloro Aniline
MPD (Local)
MPD (Japan)
Naphthionic Acid
N-Methyl J. Acid
N-Methyl Aniline
Naphthalene (Refined)
Ortho Anisidine (OA) (Imp.)
Ortho Dichloro Benzene (OD
OT Base
Para Dichloro Benzene (PDC
Para Anisidine (PA local)
PNA
Para Cresidine (Imp.)
Para Amino Azo Benzene (India)
PNCB
Para Amino Acetanilide
1-Phenyl 3-Methyl 5-Pyrazolone
Phenyl J. Acid
Para Amino Benzoic Acid
PT Base
Rhodutine Acid
Resist Salt 80%
Resorcinol
Sodium Naphthionate
5-Sulpho-Anthranilic Acid
Sulphanilic Acid
Sulpho Tobias Acid
Trichloro Benzene (TCB)
Tobias Acid
Metanilic Acid
MTD

We Manufacture Chemicals For Industrial Us

- Acetic Acid
- Acetic Anhydride
- Acetaldehide
- Industrial Alcohol
- Monochloro Acetic Acid
- Ethyl Acetate
- Butyl Acetate
- E D T A
- N T A
- Carboxy Methyl Cellu

ASHOK ORGANIC INDUSTRIES LTD.
406 Sharda Chambers, 33 Sir Vithaldas Thackersey Marg (New Marine Lines) Bombay-400 20
Phone : 252236 · 252256 · 317511   Gram : ASHOKBROS   Telex : 11-3853 AOIL IN

Also Please Contact:
Baroda : Phones 324519-325759
Telex 0175-557 AOIL IN
Ahmedabad : Phone 78009
Ankleshwar : Phone 2461 2462
Telex : 0189-238 AOIL IN
New Delhi : Phones 5710733-5711057
Calcutta : Phones 282474-282475
Telex 021-7917 SBIL IN
Madras : Phone 582046
Telex 041-7527 SBIL IN
Bangalore : Phones 5707
Telex 0845-8
Hyderabad : Phones 7373
Poona : Phone 50797

Plants at : Nandesari · Baroda · GIDC Ankleshwar · [illegible] · Bharuch

For Your Requirements Of:

BON ACID * BETA NAPHTHOL
SODIUM SULPHITE (Crude)

Contact Manufacturers

MULTI ORGANICS PRIVATE LIMITED

K-208, Keshava Bldg., 2nd Floor, Bandra-Kurla Commercial Complex,
Behind Drive-in-Theatre, Bandra (E), Bombay-400 051.
Phone Nos.: 6407778/6424736 **Gram:** MULTIORG, Bombay-51
Telex: 011-74530 MOL IN

Factory: A-1, MIDC Industrial Area, Chandrapur-442 401 (M.S.)
Phone: 7-54 **Telex:** 716-213 MORG-IN

FOR YOUR REQUIREMENTS OF

WHITE "R" LIQUID

(Whitening Agent for Polyester Fabrics)

At Rs. 215 per Kg.

Contact:

BOX NO. 1173

CHEMICAL WEEKLY
306, Shri Hanuman Industrial Estate,
G.D. Ambekar Road, Wadala,
Bombay 400 031.

DYES EXPORTERS! For Your Requirements Of:

Reactive Yellow 15/24/37/42/81/84
Reactive Orange 4/12/13/16/84
Reactive Red 2/11/31/35/76/106/141
Reactive Blue 4/13/21/25/171
Reactive Black 5/8

Vinyl Sulphones
4 N.A.P./K. Acid
N.W. Acid/Gamma Acid
O.A.P. 4 S.A./N.A.P. 6 S.A.
P.A.A.B./P.A.A.B. 4 S.A.

Acid Red 1/73; Acid Yellow 9/17; Basic Blue 7/11/26; Solvent Blue 4

Also full range of Dyes Intermediates, Direct, Acid & Basic Dyes

Please Contact

SHYAM DYE CHEM

C 608, Mercury, Hiranandani Complex, Andheri (W), Bombay 400 058
Phone: 6261728 Mr. Dinesh L. Thakkar

Bombay Dyes Market

(Prices as on December 19, 1989)

ACID COLOURS	Per Kg.
Acid Violet 4SS	*190.00
Acid Maroon V	110.00
Acid Orange II	112.95
Acid Orange IIY	93.85
Acid Red A	137.00
Acid Scarlet 3R	128.35
Acid Red 3BN	*196.00
Acid Red R2R	132.00
Acid Red RS	98.00
Acid Patent Blue AS	*280.00
Acid Green V	*375.00
Acid Coomasi Blue	200.00
Acid Yellow SGN	65.00
Acid Red PG	85.00
Acid Red GRS	78.00
Acid Black 10 BX	157.15
Acid Black BX	128.95
Acid Black Wax	136.50
Crimsein Scarlet MOO	200.30
Procinyl Yellow GS (ICI, UK)	265.00
Procinyl Red GS (ICI, UK)	530.00
Procinyl Blue RS (ICI, UK)	315.00
Procinyl Scarlet G (ICI, UK)	600.00
Procinyl Orange G (ICI, UK)	250.00
Procinyl Rubine (ICI, UK)	550.00

* To get resale price add 6% tax.

DIRECT COLOURS	Per Kg.
Yellow 3GX	114.00
Sun Yellow RCH	175.85
Fast Yellow GCH	171.50
Yellow CPG Hly. Conc.	721.00
Fast Yellow GS	126.85
Fast Yellow CHRS	116.85
Mimosa Orange A	210.95
Fast Orange GR	171.30
Red	133.60
Dark Tan	96.15
Red 8R	98.15
Red 4B	217.95
Bordeaux BW	170.10
Fast Scarlet 4BS	233.50
Red 12B	220.45
Bordeaux Hly. Conc.	249.20
Cotton Red N	117.35
Brill. Fast Helio B	297.00
Brill. Fast Helio 2R	385.85
Brill. Fast Helio 2RS	177.30
Brill. Fast Helio BS	116.10
Brill. Violet Extra	161.45
Blue 2B	102.50
Blue G	220.45
Sky Blue FB	242.00
Copper Blue GR	190.25
Fast Greenish Blue GL	114.60
Developed Black BT	149.95
Blue NS-2B	548.45
Blue NS-2BG	214.70
Developed Black NS-GHB	214.70
Green B	142.75
Green NS-B	218.90
Green 2B-N	218.90
Brown MR	197.40
Brown CN	137.00
Golden Brown G	175.85
Catechin G	155.70
Omega Tan	161.45
Catechin GS	102.80
Black E Hly. Conc.	180.15
Black E Extra Hly. Conc.	180.15
Black NS-ER Hly. Conc.	290.50

DISPERSOL COLOURS	Per Kg.
Red B 3B Conc	811.50
Red B 2B Conc	797.90
Red C-B Powder	1048.25
Red 2-2B Powder	589.85
Violet C 4R Conc.	1292.70
Blue BG Conc	580.65
Blue BN Powder	129.20
Blue D 2R Powder	588.25
Navy BT Conc	531.95
Blue B 2G Conc	577.40
Black BT Conc	719.10
Blue BR	452.40
Yellow 7GL	813.00
Yellow 5RX	289.90
Yellow 7G	471.20
Yellow	142.00
Yellow AL	147.00
Yellow Brown REL	211.75
Yellow FFL	571.40
Gold Yellow DC	[illegible]
Pink FBL	[illegible]
Red BG	[illegible]

Red 2B
Red FB
Red Violet FBL
Orange 3R
Violet 3R
Violet RL
Violet 6R
Scarlet RR
Rubine 3B
Rubine CB
Blue GL
Blue BGF
Navy Blue RE
Brown 3REL
Black GEL
Dark Brown SB

BASE COLOURS
Fast Yellow GC
Fast Orange GC
Fast Scarlet R
Fast Scarlet RC
Fast Scarlet RCR
Fast Scarlet G
Fast Scarlet GN
Fast Scarlet GG
Fast Scarlet GGS
Fast Red B
Fast Red RC
Fast Red R Flakes
Fast Red TR
Fast Red TR Oil
Fast Red RL
Fast Red KB Oil
Fast Bordeaux GP
Fast Garnet GBC
Fast Violet B
Fast Blue BB

NAPHTHOL COLOURS
ASG
AS
ASSW
ASBS
ASBO
ASE
ASOL

	369.00
	336.05
	234.00
	249.95
	2002.35
	2459.45
	143.00
	534.65
	602.60

OLOURS	Per Kg.
e HR	207.95
H4G	145.65
H 8GP	168.55
HE6G	214.75
R	276.05
H7G	382.30
	275.45
	387.65
N4G	201.15
N8G	366.10
	244.75
H2R	303.80
B	157.95
M2R	313.15
B	213.65
H RN	245.35
H 3BP	179.80
F3B	243.45
a HB	182.00
5B	160.05
6B	218.35
B	187.10
MB	163.65
H3R	219.55
TR	175.40
3R	333.75
GR	406.40
G	207.95
	286.20
TG	213.95
TRS	368.15
A	285.15
GP	585.30
H 3GP	[illegible]

Blue H-PRD	308.80
Navy Blue H3R	333.75
Blue H 5RX	238.25
Navy Blue M3R	356.75
Brill. Blue MR	405.80
Brill. Blue M RX	214.25
Brill. Blue M-G	228.45
Blue M 4GD	369.40
Navy Blue M RB	341.85
Turquoise M-G	240.30
Brill. Blue M GX	516.25
Blue 3R Acra Powder	718.20
Dark Brown H 6R	248.45
Cobalt Oxide	285.00
Green H4BD	287.50
Green H E4B	186.80
Red Brown H IF	143.25
Orange Brown H 2B	209.15
Brown M GRN	188.80
Black H-N	314.25

SULPHUR COLOURS	Per Kg.
Navy Blue	216.35
Green G	194.55
Black Grains Extra	72.25
Black Grains OG	73.75
Black GXE Conc.	70.85
Black GXE	57.90
Black GXR	66.40
Black Grains 890	52.80
Black EXR Grains	73.75
Black EXR Grains 300	59.35

VAT COLOURS (ICI)	Per Kg.
Yellow 5G Supra Disperse	561.85
Yellow 5G Acra Conc.	818.60
Gold Orange 3G Pdr. Fine	1168.45
Brill. Orange 6R Pdr. Fine	824.35
Gold Orange 3G Supra Disc	887.95
Brill. Orange 6RX Powder	394.30
Brill. Red 3B Pdr. Fine	1014.15
Brill. Red 1B Supra Disc	667.15
Brill. Purple 5R Acra Powder	[illegible]

Brill. Purple 2R Hly Conc.	1144.2
Brill. Purple 4R Supra Disc	654.2
Brill. Purple 2R Acra Conc.	776.8
Blue 2R Powder Fine	875.9
Blue BC Acra Con. Pdr. Fine	1073.7
Blue BC Conc. Pdr. Fine	770.6
Blue R Conc. Pdr. Fine	776.3
Blue Conc. Powder	445.8
Brill. Blue 2R Hly. Conc.	919.1
Blue RR Supra Powder	626.3
Brill. Blue 2R Supra Disc	[illegible]
Dark Blue 2R Powder Fine	512.8
Blue BC Supra Disc	419.85
Jade Green XBN Powder Fine	920.85
Jade Green XBN Acra Conc. Pdr.	1026.15
Jade Green 2G Pdr. Fine	920.25
Jade Green 2G Ptg. Paste	125.45
Jade Green XBN Ptg. Paste	128.90
Jade Green 2G Supra Disc	598.00
Olive D Pdr. Fine	560.90
Olive Green B Supra Disc	421.75
Jade Green XBN Supra Disc (N)	387.90
Olive OMW Powder Fine	898.95
Olive OMW Supra Disc	538.35
Olive D Supra Disc	861.75
Olive R Supra Disc	875.25
Olive D Ptg. Paste	180.00
Olive Green B Ptg. Paste	188.15
Olive Green B Acra Conc.	741.10
Olive R Acra Conc.	779.85
Brown R Pdr. Fine	888.45
Dark Brown 3R Fine	886.25
Brown G Supra Disc	502.35
Brown 2G Supra Disc	716.10
Brown R Supra Disc	547.30
Brown 3R Powder	840.75
Dark Brown 3R Ptg. Paste	217.15
Dark Brown 3R Supra Disc	329.40
Brown G Acra Conc.	947.85
Brown M. Powder Fine	768.90
Grey M. Supra Disc	599.45
Blue BC Acra Conc. Pdr. Fine	1092.75
Direct Black AC Supra Disc	416.75
Direct Black AC Pdr. Fine	576.75
Direct Black CH Supra Disc	480.45
[illegible] Ptg. Paste	[illegible]

Delhi Market

DELHI, DEC. 15, (NNS) Mercury registered a sharp rise of Rs. 300 at Rs. 10,700 per flask in the local chemicals market during the week under review on account of dwindling stock in the market as well as higher advices from Bombay. As a result of sharp increase in the prices of raw material, naphthalene balls looked up by Rs. 50 at Rs. 1,525, whereas chalkolite dropped further by Rs. 5 at Rs. 67 per kg thanks to sufficient supply from Bombay. It is noticeable therefore, that a sharp decline of Rs. 23 was reported in this commodity within three weeks. In sympathy with chalkolite, sulfolite and rangolite lost Rs. 2 each at Rs. 82 and Rs. 90 per kg.

Following satisfactory supply and absence of buying by consumers, camphor powder and tikki slipped by Rs. 3 each at Rs. 93 and Rs. 103. Ammonia bicarb and caustic soda dropped by Rs. 10 each at Rs. 140 and Rs. 510 per bag respectively. Soda bicarb slipped by Rs. 3/7 at Rs. 292/296 per 50 kg due to reduced demand. As a result of better offerings along with poor offtake, soda ash drifted lower by Rs. 1/5.

In the wake of fall in demand from plastic and paint units, titanium dioxide anatase dropped by Rs. 2, RC-822 and RCR-2 by Rs. 4 each at Rs. 84 and Rs. 100 per kg respectively. K brand titanium of Calcutta tumbled down sharply by Rs. 8 at Rs. 76. Citric acid Chinese drifted lower by Rs. 25 at Rs. 2,150 on lower advices from Bombay, while citric acid of Bombay Dyeing remained static at Rs. 2,375. Minor variation was reported in menthol prices. Menthol flake and medium moved up by Rs. 2/5 at Rs. 320 and Rs. 345 while bold remained quiet at its last week level of Rs. 355. Mentha oil sold higher at Rs. 235/255 against Rs. 230/250 and DMO remained steady at Rs. 110 per kg. Dyes and colours remained unchanged during the week.

(DELHI MARKET RATES AS ON DECEMBER 15, 1989)

Ammonia Bicarb (Per 25 Kg.)	140.00
Mercury (Per flask)	10,700.00
Soda ash (Per bag)	340/352.00
Ammonium Chloride (50 Kg.)	110/130.00
Caustic soda flakes (50 Kg.)	510.00
Citric acid (Per 50 Kg.)	2,150/2,375.00
Stable Bleaching Powder Shriram (Per 25 Kg.)	100.00
Stable Bleaching Powder KCI (Per 25 Kg.)	95.00
Stable Bleaching Powder [illegible] (Per 25 Kg.)	[illegible]
Stable Bleaching Powder [illegible] (Per 25 Kg.)	[illegible]

Sodium Bicarbonate (50 Kg.)	292/296.00
Sodium Hydrosulphite (Per Kg.)	34.00/36.50
Rangolite (Per Kg.)	67.00/90.00
Boric acid Technical (Per 50 Kg.)	1,450.00
Paraffin Wax (Per 50 Kg.)	850.00
Tartaric Acid (Trishul Per 15 Kg.)	4,200.00
Borax Granular (Per 50 Kg.)	850.00
Borax Crystal (Per 50 Kg.)	850.00
Sodium Nitrite (Per 50 Kg.)	750/800.00
Sodium Nitrate (Per 50 Kg.)	450.00
Camphor Tikki (Per Kg.)	103.00
Camphor Powder (Per Kg.)	93.00
Menthol Bold (Per Kg.)	355.00
Menthol Medium (Per Kg.)	345.00

Menthol Flake (Per Kg.)	
Glycerine (Per Kg.)	
Sodium Silicate (Per quintal)	
Hexamine (Per Kg.)	
Acetic Acid Glacial (Per Kg.)	
Copper Sulphate (Per quintal)	
Formic Acid (Per Kg.)	
Formaldehyde (Per Kg.)	
Hydrogen Peroxide (Per Kg.)	
Calcium Carbonate (Per Tonne)	2
Acid Slurry Soft (Per Kg.)	
Acid Slurry Hard (Per Kg.)	
Phosphoric Acid (Per 50 Kg.)	
Potassium Nitrate (Per quintal)	90
Potassium Permanganate (Per 50 Kg.)	2,80
Sodium Bichromate (Per 50 Kg.)	1,57
Trisodium Phosphate (50 Kg.)	
Titanium Dioxide Anatase (Per K	
Titanium Dioxide RC-822 (Per Kg	
Titanium Dioxide K-Brand (Per K	
Titanium Dioxide RCR-2 (Per Kg	
Zinc Oxide (Per metric tonne)	42,000/
Phenol Carbolic Acid (Per Kg.)	
Carbon Tetrachloride (Per Kg.)	
Chloroform (Per Kg.)	
Sodium Sulphate (Per metric tonne)	3,200
Naphthalene Balls (Per 50 Kg.)	

DYES & COLOURS	
Naphthol AS	17
Naphthol ASG	18
Naphthol ASBS	21
Naphthol ASTR	27
Naphthol ASOL	21
Naphthol ASBO	16

DIRECT DYES	
Black E. Conc.	12
Diazo Black B.T.	10
Green B	9
Blue 2 B	6
Blue 2 B (225% LNR)	
Sky Blue FB	10
Basic Auramine	
Basic Rhodamine	20
Basic Methylene Blue	10
Basic [illegible]	[illegible]
Basic [illegible]	[illegible]
Acid Orange	[illegible]
[illegible]	[illegible]

Madras Market

akes prices came
ressure selling. It
bstantial imported
ng in the market
sh of prices. However, caustic lye prices remained stable. There has been not much of a change in prices of other items which by and large kept at previous levels.

MARKET RATES AS ON DECEMBER 16, 1989)

per kg)	16.00
iron free	
	4,000.00
ate	
	140.00
(per MT)	3,000.00
	32.00
r kg)	8.50
kg)	7.50
per kg)	28.00
r 50 kgs)	220.00
	745.00
– Mettur	
	10,800.00
– Andhra	
	10,800.00
, Solid	
	3,000.00
hydrous	
	5,7[illegible]
Activated)	
	6,300.00

Calcium Carbonate (Precipitated) (per MT)	5,000.00
Citric Acid (per kg)	48.00
Copper Sulphate (per kg)	24.00
Cresylic Acid 98-99% (per kg)	130.00
Pure Para Cresol 96% (per kg)	85.00
Meta Para Cresol 42% (per kg)	50.00
Formic Acid (per kg)	37.00
Formaldehyde (per kg)	8.00
Glue Flakes (per kg)	15.00
Glycerine I.W. (per kg)	49.50
Hydrosulphite of Soda (TCPL) (per kg)	38.00
Hydrosulphite of Soda (ICI) (per kg)	42.00
Hydrosulphite of Soda (BASF) (per kg)	40.00
Hexamine (per kg)	30.00
Hyflosupercell (per kg)	19.50
Hydrogen Peroxide (per kg)	38.00
Litharge (per kg)	40.00
[illegible] (per kg)	[illegible]
Magnesium Carbonate (per kg)	[illegible]
Magnesium Chloride (per kg)	3.25
Maleic Anhydride (per kg)	48.00
Menthol Crystals (per kg)	340.00
Oxalic Acid (per kg)	24.00
Paraffin Wax (per kg)	18.00
Potassium Bichromate (per kg)	36.00
Phosphoric Acid (per kg)	25.00
Polyvinyl Alcohol Powder (per kg)	128.00
Pentaerythritol (per kg)	50.00
Phthalic Anhydride (per kg)	30.00
Soda Ash (TAC) (per 75 kgs)	375.00
Soda Ash (TATA) (per 75 kgs)	375.00
Sodium Bicarbonate (TATA) (per 50 kgs)	375.00
Sodium Silicate (per MT)	2,500.00
Sodium Bichromate (per kg)	28.00
Sodium Nitrate (per kg)	8.00
Sodium Nitrite (per kg)	15.00
Sodium Sulphide Flakes (per kg)	14.00
Sodium Bisulphite (per kg)	4.50
Sodium Alginate (per kg)	225.00
Sodium Acetate (per kg)	7.00
Sodium Sulphate (Anhydrous) (per kg)	3.00
Titanium Dioxide (Anatase) (per kg)	85.00
Titanium Dioxide (Rutile) (per kg)	90.00
Trisodium Phosphate (per kg)	7.00
Urea (Technical) (per kg)	3.00
Zinc Oxide (per kg)	52.00
Zinc Chloride Powder (per kg)	12.00
Zinc Sulphate (per kg)	8.00

SOLVENTS

Acetone – HOCL (per kg)	24.00
Butanol (per kg)	36.00
Butyl Acetate (per kg)	44.00
Benzene (per lit)	14.00
Cellosolve (per kg)	52.00
Carbon Tetra Chloride (per kg)	24.00
Chloroform (per kg)	25.00
Diacetone Alcohol (per kg)	30.00
Diethylene Glycol (per kg)	42.00
Dichloroethane (per kg)	18.00
Di-octyl Phthalate (per kg)	46.00
Di-N-butyl Phthalate (per kg)	48.00
Ethyl Acetate (per kg)	24.00
Isopropyl Alcohol (per kg)	30.00
Methanol (per kg)	10.00
Methylene Chloride (per kg)	23.00
Methyl Ethyl Ketone (per kg)	34.00
Methyl Isobutyl Ketone (per kg)	40.00
Phenol (per kg)	36.00
Sorbitol (per kg)	15.00
Triethanolamine (per kg)	65.00
Trichloroethylene (per kg)	25.50
1,1,1 Trichloroethane (per kg)	33.00
Turpentine (per lit)	18.00
Toluene (per lit)	[illegible]
Xylene (per lit)	[illegible]

Shipping News

VESSELS DUE IN BOMBAY FOR EXPORT LOADING

Due Date (1)	Steamer's Name & Flag (2)	Agents (3)	Will load for (4)
In port	Topusko (Yug)	Oceanic	Jeddah; P. Said; Rijeka. (Carting at 16-ID).
19/12	Bharatendu (Ind)	S.C.I.	Chennai (Carting at Timber Pond No. 1 & 12A-ID).
21/12	Medipas Bay (Cyp)	L. Triest/	Jeddah; Barcelona; Marseilles; Genoa; Leghorn; La Spezia; Naples; with T.P. Trieste; Venice; Ravenna; Bari; Koper; Rijeka; Las Palm Santacruz De Tenerife; Malta; Limassol; Alexandria; Casablanca Tunis; Algiers; Lattakia; Tripoli; Benghazi; Oran; Point E Pitre; Pt De France. (Carting at M-171/173 Cotton depot).
		Samrat/ Hindustan/	Barcelona; Marseilles; La Spezia; Livorno (Leghorn); Genoa; Naples and other Italian ports and FCL only Beirut; Alexandria; Valleta; Lattakia; Mersin. (Carting at M.O.D. No. 1 For both).
		Merzario	Genoa; Leghorn; La Spezia; Naples; Salerno; Marseilles; Barcelona. (Carting at M.O.D. No. 2).
22/12	Uni Pioneer (V-019) (Pan)	Greenways	Hamburg; Felixstowe; Rotterdam; Antwerp; Le Havre; London; Liverpool; Leixoes; Lisbon; Manchester; Avonmouth; Wembly; Birmingham; Leeds; Leicester; Amsterdam; Bremen; Copenhagen; Aarhus; Gothenburg; Oslo; Stockholm; Helsinki; Belfast & all destinations in U.K., Germany, Switzerland & Austria. (Carting at G/H cotton depot).
23/12	Sidi Bishr (Gr)	M.C.S.	P. Said; P. Suez; Alexandria; Jeddah; Aden & other Red Sea ports.
23/12	Firat (Tur)	U.L.A.	Istanbul & Turkish ports.
23/12	Dorothea	Samrat/ Hindustan/ Merzario	Felixstowe; Hamburg; Rotterdam also London; Liverpool; Leixoes; Lisbon; Manchester; Avonmouth; Wembly; Birmingham; Leicester; Le Havre; Amsterdam; Bremen; Antwerp; Copenhagen; Leeds; Aarhus; Gothenburg; Oslo; Stockholm; Helsinki; Belfast & all destination in U.K.; Benelux; Germany; Italy; France; Switzerland & Austria. (Carting at M.O.D. No. 2 for Merzario). (Carting at M.O.D. No. 1 for Samrat & Hindustan).
25/12	CMB Energy	C.M.B.	Djibouti; Port Sudan; Jeddah; La Spezia; Valencia; Genoa; Barcelona; Marseilles; Tunis; Casablanca; Tangier; Alexandria; Piraeus; Mersin; Limassol; Felixstowe; London; Liverpool; Manchester; Birmingham; Avonmouth; Dublin and all inland destinations in U.K.; Antwerp; Rotterdam; Hamburg; Bremen; Leixoes; Lisbon; Copenhagen; Oslo; Gothenburg; Stockholm; Malmo; Aarhus; Helsinki. (Carting at Kalamboli).
[illegible]	Orient Express (Pan) (Voy-106)	Transworld	Hodeidah; Djibouti; Port Sudan; Jeddah; Assab; Massawa; La Spezia; Naples; Malta; Beirut; Tartous; Mersin; Marseilles; Genoa; Valencia; Fos; Leghorn; Tilbury; London; Liverpool; Avonmouth; Birmingham; Manchester; Leeds; Dublin; Belfast; Antwerp; Hamburg; Bremen; Rotterdam; Le Havre; Aarhus; Gothenburg; Helsingborg. (Carting at CFS cotton green).
[illegible]	Kapitan Karl (Rus)	Transocean/	Tilbury; Avonmouth; Liverpool; Manchester; London; Felixstowe; Birmingham; Antwerp; (Rotterdam); Hamburg; Bremen; Copenhagen; Gothenburg; Oslo; Stockholm; Malmo; Leeds. (Carting at T.P. No. 3).
		I.S.S. Co.	Felixstowe; Tilbury; Antwerp; Rotterdam; Hamburg; Bremerhaven & Scandinavian ports via Hamburg. (Carting at Wadi Bunder No. 3).
[illegible]	Medipas Bay	L. Triest	Colombo (Carting at M-171/173 cotton depot).
[illegible]	Eagle Nova	P.F.C. Co.	Colombo; Rangoon. (Carting at Timber Pond No. 1).
[illegible]	Kota Melati (Sing)	Mackinnon	Karachi (Alongside).
[illegible]	Uni Pioneer	Greenways	Chittagong. (Carting at G/H cotton depot).
[illegible]	Uni Pioneer [illegible] (Pan)	Greenways	Singapore; Penang; Port Kelang; Bangkok; Jakarta; Surabaya; Manila; [illegible] Kaohsiung; Keelung; [illegible] Hong Kong. (Carting at G/H cotton depot).

	(3)	(4)	(5)
	Transocean	Main Japan ports.	[illegible]
	Transworld/	P. Kelang; Penang; Keelung; Kaohsiung; Busan; Bangkok; Kobe; Manila; Djakarta. (Carting at CPS cotton avenue).	[illegible]
	N.L.S.	Far East, Japan & Chinese ports. (Carting at T.P. No. 4).	
	S.C.I.	Main Japan ports.	[illegible]
(6)	Mackintosh	Dammam.	[illegible]
	Transworld/	Sharjah; Dubai; Abu Dhabi; Ajman; Doha; Kuwait; Dammam; Baghdad; Basrah; Syria & inland destinations in Gulf. (Carting at CPS cotton avenue).	2/1
	Sai Ship/	Dubai; Muscat; Sharjah; Abu Dhabi. (Carting at Wadi Bunder No. 3).	
	O.S.A.	Dubai; Abu Dhabi; Bahrain; Doha; Muscat; Kuwait; Dammam. (Carting at M-178/180 cotton depot).	
	Samrat/ Hindustan/ L. Triest	Boston; New York; Baltimore; Norfolk; Charleston; P. Mouth; P. Lauderdale; Miami; New Orleans; Savannah; Jacksonville; P. Everglades; Philadelphia; Halifax; Montreal; Toronto & S. American ports. (Carting at M-171/173 cotton depot for L. Triest) (Carting at M.O.D. No. 1 for both).	27/12
	Greenways	New York, Newark; Baltimore; Charleston; New Orleans; Houston; Boston; Providence (RI); Philadelphia; Norfolk; Savannah; Jacksonville; Wilmington; Miami; Montreal; Toronto; Bermuda; Los Angeles; Longbeach; Sanfrancisco; Oakland; San Diego; Stockton; Richmond; Almenda; Redwood City; Sacramento; Seattle; Portland; Vancouver (B.C.); Tacoma; Longview; Chicago; Dallas; various inland destinations & Caribbean ports. (Carting at G/H cotton depot).	27/12
	C.M.B.	Norfolk, New York; Baltimore; Philadelphia; Charleston; Savannah; Houston; Miami; New Orleans; via Antwerp; Montreal; Toronto; Halifax. (Carting at Kalamboli).	27/12
	Transworld	Los Angeles; Longbeach; Sanfrancisco; Oakland; Seattle; Vancouver; New York; Boston; Toronto; Montreal; Philadelphia; Norfolk; Baltimore; Charleston; Savannah; Jacksonville; Miami; New Orleans; Houston. (Carting at CPS cotton avenue).	3/1
Rus)	Marathon	Boston; New York; Baltimore; Norfolk. (Carting at T.P. No. 3).	2/1
	L. Triest	with T.P. Lagos/Apapa; Abidjan; Dakar; Douala; Cotonou; Nouakchott; Libreville; Tema; Matadi; Conakry; Freetown. (Carting at 171/173 C.D.).	27/12
	C.M.B.	Lagos; Abidjan; Lome; Douala; Matadi; Port Gentil; Pointe Noire; Nouakchott; Cotonou; Dakar; Luanda; Monrovia; Tema via Antwerp. (Carting at Kalamboli).	27/12
	Merzario	Dakar; Abidjan; Monrovia; Lome; Douala; P. Noire; Matadi; Libreville; Cotonou; P. Gentil; Lagos; P. Harcourt; Warri; Freetown; Conakry; Louanda; Nouakchott; Guinea; Bissau. (Carting at M.O.D. No. 2).	[illegible]
	Transworld	Monrovia; Lome; Lagos; Douala; Tema; Takoradi; Abidjan; San Pedro. (Carting at CPS cotton avenue).	[illegible]

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vsk	[illegible]	China
Kud	Transocean	U.K. Cont.
Lake	Sai Ship	U.K. Cont.
e	Transworld	Cont.
ng	[illegible]	Australia
	[illegible]	Gulf
a Prefidis	[illegible]	U.K. Cont./US

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Materials Imported

ERIALS IMPORTED
MADRAS
.11.89 To 10.11.89)
from previous issue)

ACID 88/BP/USP: From Pharmco, 2,300 Kgs.,

OLE BP 80: From China: emie Pvt. Ltd., 250 Kgs.,

MIDE HCl USP: From Fine Pharmaceuticals, 10 ,477.

ENE GLYCOL USP: From Boake Allen India Ltd., , Rs. 10,94,605.

ISOL HCl BP: From hu Meena Agencies, 250 s.328.

N B-12: From Hong Kong: Dadha Pharmaceuticals Ltd., , Rs. 76,039.

RIALS IMPORTED
BOMBAY
n 1.11.89 to 9.11.89)

HENONE: From FRG: ic Pvt. Ltd., 15,200 Kgs., 28.

AMIDE: From Japan: Pharmachem International, 5,000 Kgs., Rs. 1,27,156; True Food Corpn., 5,000 Kgs., Rs. 1,27,156.

ALUMINA: From USA: Tony Electronics Ltd., 2,007.17 Kgs., Rs. 2,79,021.

DL-2 AMINO BUTANOL: From FRG: Lupin Labs Ltd., 1,521 Kgs., Rs. 21,70,687.

1-AMINO-4-METHYL PIPERAZINE: From Japan: Cepham Organics Ltd., 300 Kgs., Rs. 2,54,312.

ORTHO AMINO PHENYL ORTHO CRESYL ETHER: From France: Shalimo Interaux Pvt. Ltd., 420 Kgs., Rs. 93,236.

ANILINE OIL 99.5%: From FRG: Ascent Trading Co., 12.25 MTs., Rs. 2,57,534.

ANILINE OIL: From Portugal: Deluxe Sales Corpn., 16,000 Kgs., Rs. 3,14,668.

ACETYL ACETONE: From FRG: Indian Drugs & Pharma Ltd., 2,812 Kgs., Rs. 1,26,699.

AROMATIC CHEMICALS: From Japan: Hindustan Lever Ltd., 180 Kgs., Rs. 66,972; From Switzerland: Oriental Aromatics, 200 Kgs., Rs. 65,532; From USA: Asian Paints India Ltd., 1,000 Kgs., Rs. 2,11,927.

2 B ACID: From Korea: IDI, 3,000 Kgs., Rs. 2,69,571.

BROMINE LIQUID: From UK: Arlabs Limited, 34,820 Kgs., Rs. 9,28,616.

1,3 BUTYLENE GLYCOL: From Japan: Glindia Ltd., 16,000 Kgs., Rs. 4,66,006.

CAPROLACTAM: From USA: Century Enka Ltd., 2,550 Kgs., Rs. 77,38,719.

2 CHLORO 5 TOLUIDINE 4 SULPHONIC ACID: From Netherlands: Sudarshan Chemical Inds., 1,300 Kgs., Rs. 9,58,757.

CYSTEAMINE HCl: From Japan: Glindia Ltd., 2,000 Kgs., Rs. 3,31,284.

DICHLORO NAPHTHALENE: From Japan: Reine Chemicals, 500 Kgs., Rs. 82,416.

DICYANDIAMIDE: From FRG: Vipla Organic Pvt. Ltd., 16 MTs., Rs. 49,808.

DIMETHYL ACETYL SUCCINATE: From Australia: Rohu Dyechem Pvt. Ltd., 6,200 Kgs., Rs. 8,36,114.

DIMETHYL BENZYL CARBINYL ACETATE: From Japan: Hindustan Lever Ltd., 250 Kgs., Rs. 59,341.

DIMETHYL UREA: From FRG: Bakul Aromatics & Chemicals, 27 MTs., Rs. 6,83,246.

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4,4, DIPHENYL METHANE DI-ISOCYANATE: From FRG: 18,000 Kgs., Rs. 6,71,584.

1,4 DIOXANE: From Japan: Glindia Ltd., 16,000 Kgs., Rs. 3,70,903.

EDIPHENPHOS TECH.: From Japan: Bayer India Ltd., 3,168 Kgs., Rs. 4,46,636.

EPICHLOROHYDRIN: From Japan: Asian Paints India Ltd., 4,080 Kgs., Rs. 1,16,902.

ETHYL MERCAPTAN: From Netherlands: Pesticides India, 1,248 Kgs., Rs. 3,25,956.

HEPTANE: From FRG: Kantilal Manilal & Company, 225 Kgs., Rs. 8,205.

HEXA CHLORO CYCLO PENTADIENE: From USA: Excel Inds. Ltd., 200 MTs., Rs. 63,59,075.

HEXYL SALICYLATE: From FRG: Devatha Inds., 100 Kgs., Rs. 17,344.

HYDRAZINE HYDRATE: From Japan: Salpra Pharma & Chem., 7,200 Kgs., Rs. 2,50,243.

D(-) ALPHA PARA HYDROXY PHENYL GLYCINE BASE: From Italy: Kopran Chemical Co. Ltd., 2,000 Kgs., Rs. 9,32,476.

8-HYDROXY QUINOLINE: From France: Salvi Chemical Inds., 1,000 Kgs., Rs. 2,13,059.

IODINE CRUDE: From Japan: Dechem Inds., 1,000 Kgs., Rs. 3,39,083.

ISOBORNYL ACETATE: From FRG: Dujodwala Resins & Terpenes, 50 MTs., Rs. 9,31,938.

ISOPHORONE: From Japan: Hindustan Ciba Geigy Ltd., 950 Kgs., Rs. 2,04,455.

ISOPROPYL ALCOHOL: From Taiwan: Asia Trade Enterprises, 12.8 MTs., Rs. 1,53,548; General Pharma Pvt. Ltd., 8,000 Kgs., Rs. 1,80,369; Khanna Junker Ltd., 51.2 MTs., Rs. 6,07,636.

LACTIC ACID: From China: Sparkling Investment Co., 13 MTs., Rs. 2,00,567.

LILIAL: From Switzerland: Fine Fragrances Pvt. Ltd., 1,140 Kgs., Rs. 2,95,666.

LITHOPONE: From China: Dyes Distributors India Ltd., 17.5 MTs., Rs. 91,977.

2,6 LUTIDINE: From Japan: Chandra & Co., 370 Kgs., Rs. 79,173.

METHYL ACETOACETATE: From Japan: Pacific Export, 8,000 Kgs., Rs. 1,87,286.

METHYL ISOBUTYL KETONE: From Taiwan: Gupta Trading MTs., Rs. 2,34,984.

METHYL THIOPHENAT Japan: Motilal Pesticides P. L Kgs., Rs. 4,98,674.

METHYLENE DIBROMI USA: Rallis India Ltd., 16, Rs. 2,30,869.

PHENTHOATE TECH.: F Motilal Pesticides P. Ltd., 5, Rs. 5,34,056.

D(-) ALPHA PHENYL G CHLORIDE HCl: From Ital pal Pharm Ltd., 210 Kgs., Rs

PIVALOYL CHLORIDE France: Kopran Chemicals 6,120 Kgs., Rs. 4,01,949.

POLYVINYL ALCOHO Japan: Morris Electronics Li Kgs., Rs. 1,66,151.

RESORCINOL: From Jap Ind., 5,000 Kgs., Rs. 3,39,68

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857; Hanuman Overseas
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From UK: Keshavlal
Co., 17,000 Kgs.,
From USA: Asian Paints
00 Kgs., Rs. 12,71,561;
olac Paints Ltd., 3,000
96,992; ICI India Ltd., 45
9,39,130; Jalgaon Pipes
Pvt. Ltd., 5.987 MTs.,
Jayee PVC Pipes Pvt.
MTs., Rs. 3,26,211; New
India, 18.14 MTs.,

RO ETHYLENE: From
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LENE GLYCOL: From
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OXY BENZALDE-
China: Lawande Pharm
00 Kgs., Rs. 7,78,195.

METHOXY BENZAL-
From France: Merion Fine
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DINE DIHYDROCHLO-
Korea: IDL 1,200 Kgs.,

YLENE: From FRG:
Chemicals Ltd., 1,000

MTs., Rs. 60,69,584; From Italy: Herdilia Chemicals, 1,000 MTs., Rs. 62,74,227.

PARAXYLENE: From FRG: The Bombay Dyeing & Manufacturing Co. Ltd., 2,523.823 MTs., Rs. 2,87,54,758.

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HDPE: From Saudi Arabia: Mineralia Boston Stores, 1.15 MTs., Rs. 2,09,849; Nilkamal Plastics & Allied Inds., 102.9 MTs., Rs. 12,03,762; Sagar Inds. India Ltd., 102.9 MTs., Rs. 11,33,978; Shalimar Pack, 51.45 MTs., Rs. 6,62,941; Southern Consolidated, 34.3 MTs., Rs. 41,28,884; Southern Plastics India, 17.15 MTs., Rs. 2,06,442; Southern Union Plastic Inds., 17.15 MTs., Rs. 2,06,442.

HDPE: From Saudi Arabia: Tecnoplast, 51.45 MTs., Rs. 6,62,941; From USA: Paramount Plastic Inds., 13.608 MTs., Rs. 1,56,834; R.R. Polymers Pvt. Ltd., 36 MTs., Rs. 5,24,633; Shankar Packagings Ltd., 51 MTs., Rs. 6,26,368; Shanti Packaging P. Ltd., 70 MTs., Rs. 8,90,092; Shri Mahaveer Polyplast Inds. 13,472 Kgs., Rs. 1,56,458; Vasa Investments Ltd., 51 MTs., Rs. 6,83,082;

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LDPE: From Qatar: Multi Films Plastics Pvt. Ltd., 33 MTs., Rs. 4,10,4[illegible]; From Saudi Arabia: Mitsukoshi Thermowares, 49.5 MTs., Rs. 8,26,705; Multi Films Plastics Pvt. Ltd., 16,500 Kgs., Rs. 2,04,213; From USA: Hindustan Packaging Co. Ltd., 78,998 Kgs., Rs. 11,46,098; Pushpa Impex Pvt. Ltd., 34 MTs., Rs. 4,32,330; Shankar Packaging Ltd., 17 MTs., Rs. 2,14,596.

LLDPE: From Korea: Sachdeva Enterprises, 49.5 MTs., Rs. 5,45,500; From Saudi Arabia: Jamnadas Murlidhar Jaisingh, 4,950 Kgs., Rs. 81,193; Naresh Traders, 82.5 MTs., Rs. 8,59,205.

MDPE: From Belgium: Upcon Cables Ltd., 95 MTs., Rs. 19,52,528.

POLYPROPYLENE: From Belgium: Gujarat Propack Ltd., 3,000 Kgs., Rs. 1,55,294; Ishwar Arts, 30 MTs., Rs. 3,56,038; K. Raheja Exports Pvt. Ltd., 45 MTs., Rs. 5,65,686; Kamath Plastics Pvt. Ltd., 15,000 Kgs., Rs. 1,83,105; Milton Plastics, 60 MTs., Rs. 7,07,066; Rajasthan Petro Synthetics, 4,500 Kgs., Rs. 73,844; Rising Star Plastics Pvt. Ltd., 30 MTs., Rs. 3,48,108; Vikram Plastics, 30 MTs., Rs. 3,56,038.

POLYPROPYLENE: From Czechoslovakia: Darshit Enterprises, 30.2 MTs., Rs. 2,89,813; Hukumchand & Sons, 30 MTs., Rs. 2,87,894; Jyemko, 30 MTs., Rs. 2,87,894; Naresh Paper Bag Co., 59.4 MTs., Rs. 5,67,030; Naresh Traders, 42 MTs., Rs. 4,03,050.

POLYPROPYLENE: From Finland: The Supreme Inds Ltd., 59.75 MTs., Rs. 7,19,935; From FRG: Bio Polymers Ltd., 20,000 Kgs., Rs. 3,26,272; From Italy: Joshi Formulations Pvt. Ltd., 15,000 Kgs., Rs. 2,49,226; From UK: Gold Plast India Pvt. Ltd., 30,075 Kgs., Rs. 3,72,224; From Yugoslavia
Enterprises, 31 MTs., Rs. 3
Harkab Holdings Pvt. Ltd., 15
Rs. 1,97,694; Indo Pacific
Corpn., 31 MTs., Rs. 3,95,647
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Raj Pipes Pvt. Ltd., 200
Rs. 27,93,651; From FRG:
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Rs. 2,77,732; From Korea
Supreme Inds. Ltd., 150
Rs. 19,13,987; From Mexico
Polytubes Pvt. Ltd., 3 MTs., Rs.
Kuber Overseas Pvt. Ltd., 10
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MTs., Rs. 7,36,201; Mahabir Ch
Inds., 49.95 MTs., Rs. 6,37,45
tatex Extrusion & Moulds, 50
Rs. 6,34,180; Raj Pipes Pvt. L
MTs., Rs. 18,65,522; Roto Scr
Pvt. Ltd., 30 MTs., Rs. 5,89,23
Oxides & Chem Ltd., 136.9
Rs. 21,08,658; Super Inds., 16.
Rs. 2,12,484; From Romania
Chemicals Ltd., 100
Rs. 39,06,259; Vinyl Produ
MTs., Rs. 25,86,536; From
[illegible] Plastics Pvt.
MTs., Rs. [illegible]
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87.

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48.

M ADIPATE: From
ew Era Tech., 350 Kgs.,

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nson Valves Ltd., 1,000
57.

Y OXIDE: From Japan:
a Ltd., 5,000 Kgs.,

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ami Products, 200 Kgs.,
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2,53,221: From USA:
Dhoop Factory, 894

CALS: From USA:
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s., Rs. 1,38,296.

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m FRG: Maschmeijer

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m-CRESOL: From FRG: Maschmeijer Aromatics India Ltd., 14,400 Kgs., Rs. 6,46,087.

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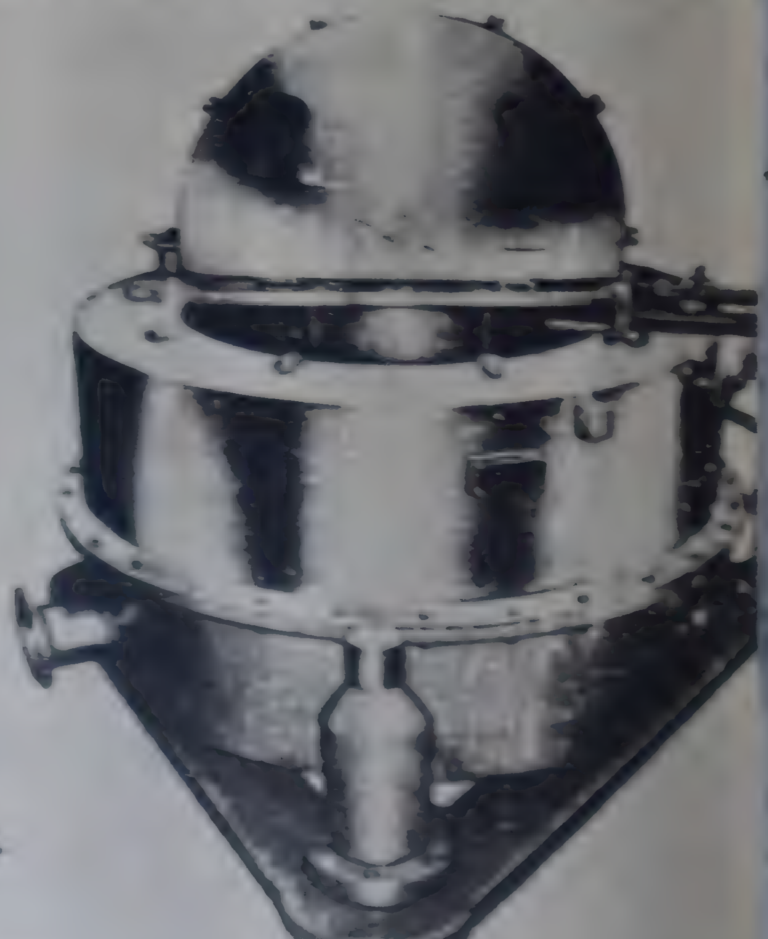

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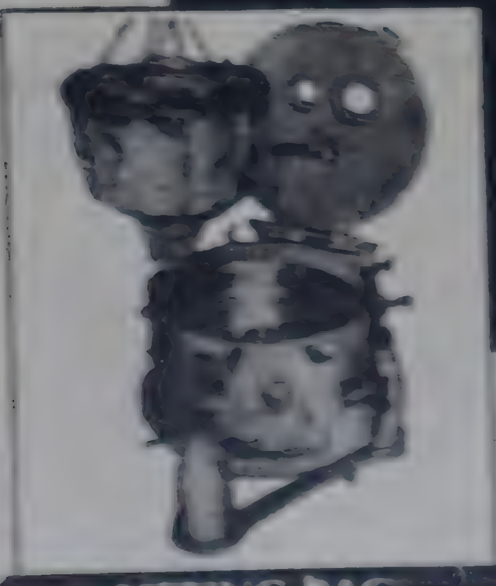
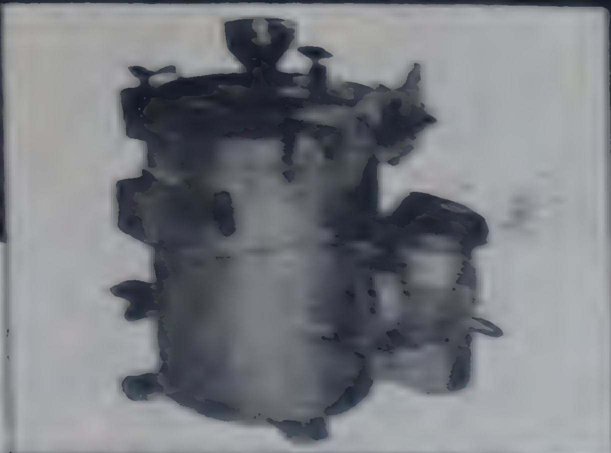

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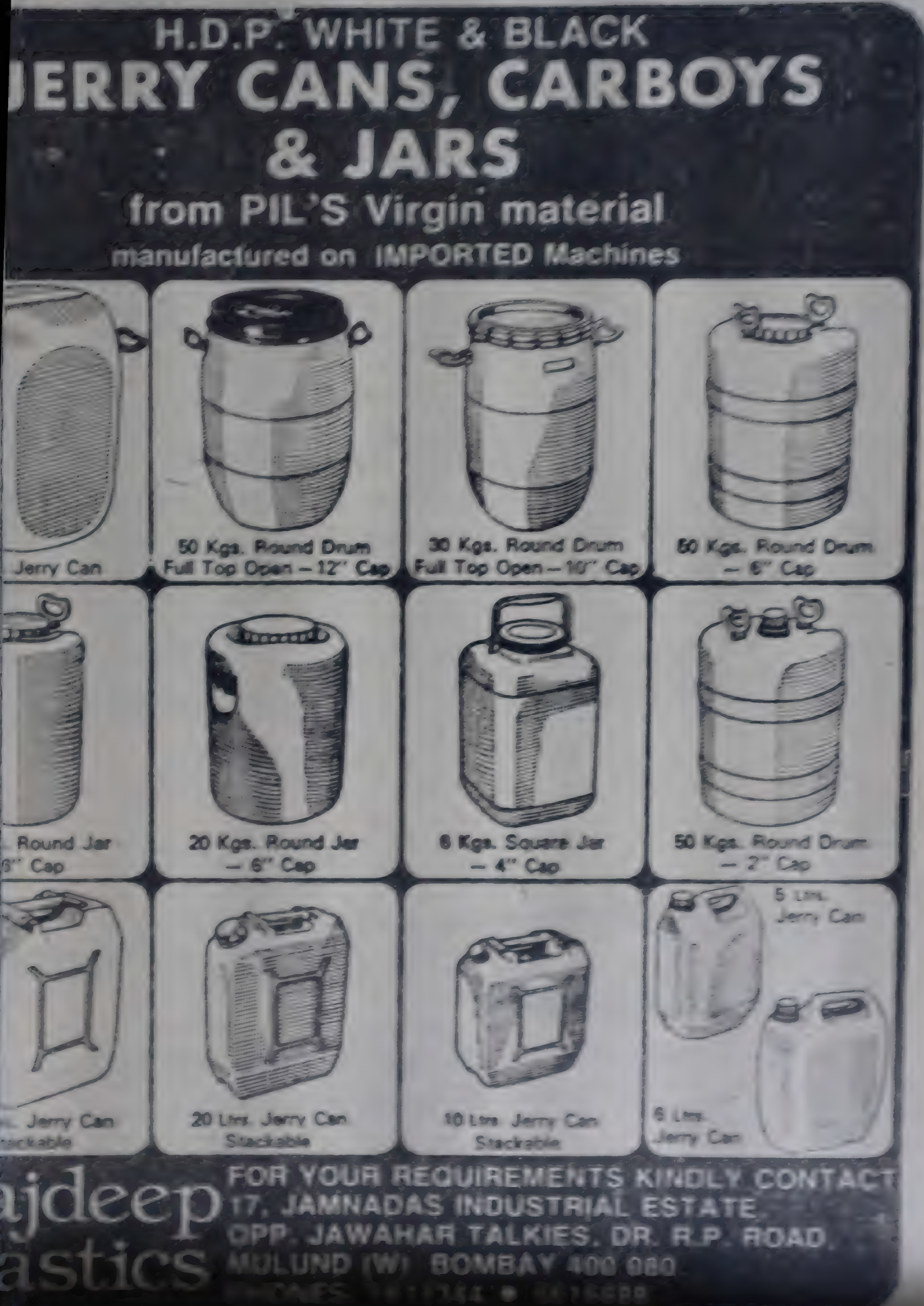

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WEEKLY

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HERALDING THE 21st CENTURY - 33

A Seer's Catalogue

nto the future is often like venturing into unexplored
. It creates exhilaration along with the feeling of uncer-
merican Futurology Journal *OMNI* interviewed lead-
ds of science, economics, politics, art, education and
nt regarding their views as to what changes one can
next three decades in their field of human endeavour.
ts agreed the world is on the threshold of startling

judgement one may pass on any particular analysis,
r revelation, it is clear that the times are ripe for all
ling changes. In America in the year 2007, various
s, we are promised polymorphous perversity, peace in
East, babies born of artifical wombs, and life in ten
And we will have a chance to unite body, mind, and
s we have never had before.

s, Chairman of the Board, Microsoft Corporation:
ng of digital information is improving very quickly.
ou'll have 30 to 40 times as much computational power.
hat you now receive just passively from TV — you'll
lf into a game or even change the outcome according
es. So in 20 years your ability to get information will
d exponentially.

es the information Age will be here, absolutely. The
ing the world database at your fingertips will have
ility. You will have stored very high-level represen-
at the sun looks like or how the wind blows.

will have serious voice recognition. I expect to wake
Show me some nice Da Vinci stuff,'' and my ceiling,
ion display, will show me what I want to see — or
ort of music or video. The world will be online, and
to simulate just about anything.

things are going to vanish from our lives. There will
that keys off on physiological traits, whether it's voice-
print, so credit cards and checks — pretty flimsy deals
have got to go. Passive entertainment will disappear
to get involved. It will really start to change the qual-
ainment because it will be individualized.

see the idea that the machine really knows them and that the machine can create experiences formed around the events in their lives to fulfill their particular needs and interests. But there's a danger too. It will be easy to feel worthless or overwhelmed by the amount of data. So what we'll have to do is make sure the machine can tailor the data to the individual.

Probably all this progress will be pretty disruptive stuff. We'll really find out what the human brain can do, but we'll have serious problems about the purpose of it all. We're going to find out how curious we are and how much stimulation we can take.

Take the change in movies in the last few years. Just a few years ago you had to find out where the movie was playing, then go to a certain neighbourhood and stand in line to see the movie. Now you can go two blocks and find 10,000 titles. You feel inadequate. It's going to be intimidating.

But in the next 20 years you won't be able to extrapolate the rate of progress from any previous pattern or curve because the new chips, these local intelligences that can process information, will cause a warp in what it's possible to do. The leap will be unique. I can't think of any equivalent phenomenon in history.

Tony Verna, President, Global Media; Director of Live Aid and Sport Aid, Inventor of Instant Replay: I can tell you step-by-step what's going to happen. We'll have high-definition TV with a wide screen of, say, 1,125 lines rather than the conventional 525 lines. And the aspect ratio on your set will be five-to-three, not four-to-three. The resulting images will rival 35 mm film in quality. These sets will be wallprojection units, either liquid-crystal disc players or the familiar cathode-ray tubes, without their current depth. You'll see this first in public places like bars — wide screens with beautiful pictures of football games and so on. All this will happen very soon, probably about 1990.

Shortly after that, we'll have digital TV and the viewer at home will become a participant in the actual production. He'll play director. He'll switch cameras himself to look at the game from different views. By then tapes will be so small they'll be like little balls of thread on your TV set, and you can have them taping the end zone while you are watching the 50-yard-line camera.

There will also be a truer form of 3-D television, one with no TV set. You'll wear a pair of glasses and each lens will have to own little TV set. Separate liquid-crystal screens will be built into the pair of glasses. The screens will be translucent so that if the tea kettle boils and you have to move to the stove, you'll be able to see through them. You won't feel claustrophobic.

Then there will be no TV — not even on your eyes. The images you'll watch will be projected by lasers. There will be three laser beams, and each beam will cover the red, blue, and green spectrums. The image will appear in your living room, without a screen, wherever these three beams actually converge — where they hit is where the image will appear. The next step will be a molecular digitizer of ions. You'll need an ion camera, not laser beams, to pick up the image. The camera will pick up signals that are bounced off the invisible part of the light spectrum. You won't have a TV set but a positive and negative grid in your ceiling and floor. When these rays come into the ion chambers the images will form.

The next innovation, Sensavision, will be like a Walkman attached to your forehead. You won't actually have your head wired because infrared wires will send signals to you. In 2007 Mick Jagger will be onstage, and when Mick feels heat, you'll feel heat. If a spray of water hits Tina on the back, you'll feel that, or you'll switch to the stands and smell what people are smoking. There probably will have to be a computer cutoff point to prevent the emotional sensations from getting too intense, especially for sex scenes or if you're watching a car race when the race-car driver crashes.

The viewer will be able to conquer time and space with the tube. Someday the director's and producer's jobs will end in the control room, and the viewer's job will begin. With laser vision, you are going to walk around in the scene. With Sensavision, you'll be able to feel the thrill of victory or the agony of defeat. All this will change the world. The ability to communicate — that's what it's all about. Twenty years from now we certainly should have more empathy and compassion for each other. And that's without a world leader putting Sensavision on his forehead to feel what it's like for someone else.

William McGowan, Chief Executive Officer, MCI Communications Corporation: Information will be a kind of international standard, the way we now think of gold. It is going to be a controlling factor in international trade. At MCI we are now trading 24 hours a day. Most companies will be trading 24 hours a day in just a few years. You won't hear that clanging bell when the market stops. It's going to be a continuum because information is that way. I can reach any information I could possibly use in a few seconds with my little PC — whether it's commodities, news, or a search.

People are worried about information overload, but that's a copout. They're just not sure they can become part of the process because you can get the information in the manner you want, in the form you want, and at the moment you want. So you control the process. It's going to be fantastic. For example, in Washington six universities are going to combine their libraries of rare books. When you realize that a compact disc — a four-and-a-half-inch disc — can contain the same amount of information as 11,000 floppy disks, you say to yourself, Hmm, maybe this is going to be interesting. And we still have in the cost of computing power using today's technology. Then we may have to figure out how to compute using chemical reaction. Probably the best guess is light for computing power. Just look at what is hapening now in fiber. I'm convinced we will have 1.6 gigabits per fiber within two years. That's 50,000 voice channels per fiber, with a fiber that's thinner than a human hair. Can you imagine the value, the economics that are going to come out of telecommunications and computing power 20 years from now?

Timothy Leary, President, Futique St. ware Company: 2007 the problem of scarcity will be solved. Because most w will be done by robots and computers, you won't have to w Material possessions won't mean as much to us as they do n If there are nine Porsches in your garage, you're going to say, "T them away". We've done that with wheat and grain, and we do it with other things if we put our minds to it. The way we de human beings will change. You won't be a serf, a slave, or a wor What will you be? A performer. Everyone will be performing. I sive listening, passive observing, passive watching will disapp

In 2007 you'll be living in an information society in which in mation will be what money and machinery were in the Indus Age. Everyone is going to be a psychologist, computer whiz, losopher. Mind play, mind performance, psychological skill are g to be the equivalent of land, money, and power in the earlier a Now to the nuts and bolts of this stuff. Every kid will learn I to communicate at a very young age; every kid will have his computer — like a pair of sneakers, a pair of Nikes. No one steal a computer, because you'll throw them away. And every will learn how to chart his thoughts and his mental performa — like a baseball player's stats. Even kids will plot their thou like they plot their batting average. The name of our species is H sapiens. That means we're the organism that thinks, and our cies finally will be proficient in thinking.

Within 20 years we'll have scrapped the current system of tisan politics. Partisan politics belongs back in an age of feudal or at most the industrial Age. It is insane to run a highly com cated; technological, pluralistic society like America when you I in the cabin of the spaceship a Democratic and a Republican didate kneeing and gouging and beating up each other to see w going to be president for four years. In an electronic society an i ligent person would no more send Tip O'Neill to Washingto make his laws than you'd send Tip O'Neill to the wine shop to out a good wine for you. Everyone is going to be responsibl government. It will be done by televoting, perhaps every Su between, say, twelve and one. But we'll be voting on major is — not parties, people, or a glamorous candidate who will pla our superstitions and emotions. You'll educate yourself on the is by using your own thought-processing appliances, the new c puters. So you'll be continually teaching yourself, continuo learning.

Right now there is a great deal of concern about the drug p lem in 20 years there will be hundreds of neurotransmitters that allow you to boost up and activate your brain and change m performance. There are going to be what I call brain radios — I ing aids you put in your ear — that will pick up and commun with the electricity in your brain. You will be able to tune in brain aspect, like sex, that you want. You will speed up or down your thinking. Anything you can do with chemicals you do with brain waves, and they are so much healthier. Drugs be old-fashioned. No one will be addicted because you can just on the ultimate orgasm and keep it going for an hour. But how are you going to do that? You'll get bored. You're going to to turn it down or all. The criminality of drugs is what is ca the so-called drug crisis, but if you legalize a brain radio — you're going to have to — everyone will have the ability t into any emotional, mental, or sensual experience. We will use radios to think more clearly and above all, to communicate c and above all, to communicate more clearly. The key to the tw first century will be five words. TFYQA — think for yoursel question authority.

— T.P.S. RA

HEMARENA

. VENKITESWARAN

High growth for Hydrogen Peroxide

mong the few chemicals which show a high growth now
drogen peroxide. Capacity increases and new plants have
spurred by surging demands for pulp and paper indus-
waste water treatment and some new areas. North Amer-
capacity is estimated at 220,000 to 250,000 tonnes with
al production of 200,000 tonne in 1989. An expected
,000 tonnes of new capacity is expected by 1993 to feed
itional demand of same amount in the next five years.
thirds of the new demand is for new uses - waste water
tment, chemical synthesis and food.

nterox is starting up a 20,000 TPA plant (at 100%) in
shington USA at a cost of $ 60 million. FMC is also com-
ing a 30,000 TPA plant in British Columbia, Canada.
ychem, a joint venture of Atochem & Air Liquide, is taking
a 40,000 TPA plant while DuPont is also going ahead with
milar venture, both in Canada. The new Chemo Thermo
chanical Pulp — CTMP — process is used by new pulp
ts and uses hydrogen peroxide for bleaching. Pulp and
er industry may absorb 50% of peroxide production in
next few years due to increasing restraints on pollution.
her new markets are due to developments in aseptic food
kaging, geothermal energy, and waste water treatment.
drogen peroxide is an ideal oxidant as it leaves no resi-
s whatever. It can destroy and detoxify phenols, sulfides
mercaptans and a host of other unwanted organics.

An emerging use is in bioreclamation-which uses bacteria to biodegrade organics but with hydrogen peroxide as the source of oxygen. Bioaugmentation is another innovation and uses hydrogen peroxide along with ozone and ultra violet light to destroy toxic contaminants including perchloroethylene. The environment related market may be the major outlet by AD 2000. Ultrapure grades of hydrogen peroxide are used by electronic industry and in semiconductor production. More interesting is a possible use for cellulose conversion — into a non-caloric fibre source for human food or as a carbohydrate source for animals. Newer synthetic methods use it as an oxidiser. The switch to peroxide for chemical oxidation may be more costly but has advantages of generating no pollution. Present breakup in usage in USA is said to be --

Pulp paper	155 to 180 mill lbs
Environmental	74 to 90 mill lbs
Chemical synthesis	80 to 90 mill lbs
Textiles	60 mill lbs
Miscellaneous	50 mill lbs

India is yet to have a significant production at reasonable costs. Of the two plants, the new one is export oriented. There has been talk of a joint venture with DuPont for 5000 TPA (as 100%) but this is yet to take final shape. Technology is still the alkylanthraquinone oxidation route and there is no alternative to import. Hydrogen source and cost is a significant factor but otherwise it is a chemical of low direct cost of manufacture.

Can Vinylon fibre find a place?

fibre from polyvinyl alcohol has been a unique devel-
ent from Japan but has remained static and confined to
n for nearly two decades until China started production
h Japanese association. Kuraray is the producer of "Poval"
ugh a unique process of reacting polyvinyl alcohol of the
cial grade with formaldehyde and then spinning the resul-
t resin. The fibre has properties closely resembling cotton
h its comfort feel and has wide ranging dyeability and
her strength than cotton. Probably less than 25000 tonnes
he present market. Enquiries on possible introduction into
ia have shown little promise due to very high price of vinyl
tate monomer in India and at too small capacity levels
enable reasonably sized fibre plant at high investments.

Now there is news of a higher strength vinylon fibre from Kuraray who are building a 4000 TPA plant. The tensile strength of the fibre is said to be 13 g/denier, nearly 2.5 times that of the regular grade. This new grade is meant for industrial uses—as a substitute for asbestos in reinforcing concrete developed by a Swiss company. The potential market is said to be 20000 tonnes for Europe in 3 years. There is also a grade of vinylon used as thermal bonding fibre for use in adhesive tape and industrial-use paper. Flame retardant grade has also been developed by blending Poval with special inorganic fillers and blending with polynosic rayon. There is indeed possible new avenues of usage of this rather neglected fibre, away from textiles.

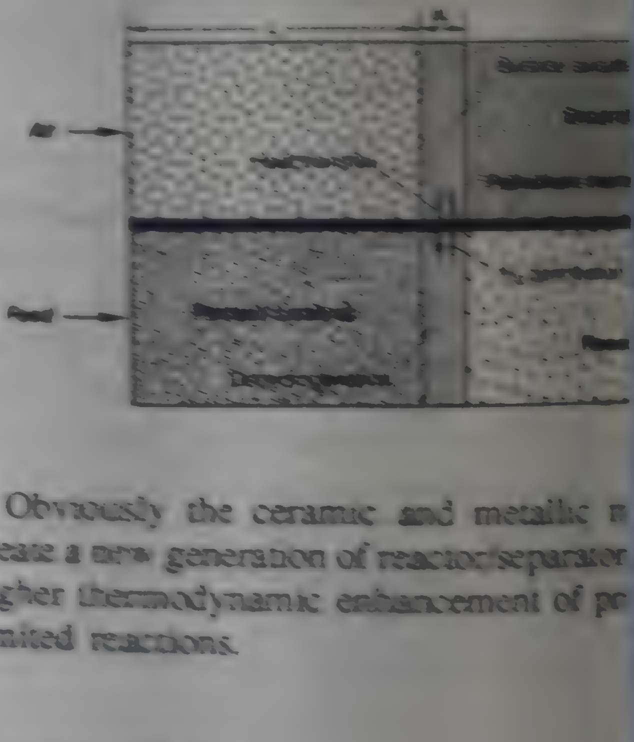
Membranes for methanol oxidation and dehydroge

The oxidation of methanol is conventionally by silver as catalyst either in a fibre network or in a heterogeneous carrier. Now in a unique approach by a researcher at a University in Holland, the silver is implanted in an alumina membrane reactor which becomes a reactor-separator. This membrane has been under development for some years and the membrane can itself be a catalyst (perhaps for ethylene from ethanol) or coated with catalyst material. The reactor can be compartmentalised for convective flows of reactants and coupling of chemical and physical processes on either side. Alumina or silver loaded alumina with microporous top layers supported on substrates of alpha alumina. The silver on the surface reacts with methanol from the gas phase and formaldehyde is formed when catalyst is strongly bonded to the surface. Selectivity and optimisation of conditions have to be established — probably at 500-600°C. Regeneration cycles of catalyst surface can also be arranged.

The process is still at developmental stage and it is too early to foresee commercial use but it shows the scope for the new inorganic membranes.

At another centre in the University of Cincinati, USA more valuable work is going on under an Indian expatriate professor Rakesh Govind and associates. They have a palladium membrane which is permeable only to hydrogen. When there is dehydrogenation on one side of the membrane the hydrogen going to the other side is oxidised by air and the dehydrogenation proceeds well with product coming out from the other end of reactor side. The oxidation
erates heat which is suitably transferred to
A notional model for this type of reaction
illustration. The studies with 1-butane show
sions to butene under adiabatic conditions
lengths. Other dehydrogenations like ethyl
rene and butene to butadienes as well as ox
anol to formaldehyde are to be studied. P
with silver or transition metals is said to c
of poisoning or embrittlement with hydro

**Membrane reactor model combine
dehydrogenation**



Obviously the ceramic and metallic m
create a new generation of reactor/separator
higher thermodynamic enhancement of pr
limited reactions.

Stabilising geotextiles

Geotextiles is a new term in the use of plastics — as substitutes for materials such as sand and gravel or for run off control and environment protection. These are fibres from plastics meant for heavy duty usage including liners for containment ponds. The most widely used plastic is polypropylene. But the product requires to be protected against degradation in the open environment, from photo chemical reactions and also from excessive heat and shear. Better stabilisers have been introduced by Ciba-Geigy for geotextiles. The degradation mechanism is through chain scission or crosslinking.

For countering thermal degradation a radical terminating antioxidant — usually a complex hindered phenol — is used, along with phosphites and thioethers. Ultra violet stabilisers screen the polymer by absorbing ultra violet radiation or quenching [illegible] are used [illegible] light stabilisers HALS are another group.
have produced a 10 fold rise in stabilisation
mary antioxidant phosphites and HALS ha
More complicated molecules are now the m
the use of special antioxidants/stabilisers
growth.

The estimated use of geotextiles is ab
metres in USA—quite a large market for
highways the geotextile is tacked down to
ments with an asphalt emulsion and then
on it—serves as a waterproofing barrier

Such a barrier over the soil for founda
useful. Lining of drainage channels or p
vent seepages. They serve also as a rein
retaining walls and other construction are
such applications is indeed vast and con

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enzaldehyde
isphenol
utyl Titanate
utylene Glycol
alcium Citrate

Chloroform
Chloro Propionic Acid
Choline Chloride
Citric Acid
Cresylic Acid
Cyclohexanol
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Kunstoff project to go on stream by June

The Rs. 30 crore plastic pipes and tanks project of Kunstoff Industries Ltd., belonging to the Bhama Pipes group from Bombay, will go on stream by June 1990.

The unit will manufacture large diameter pipes ranging from 300 mm to 3000 mm and tanks for water and chemical storage scrubbers, gobar gas tanks, rain water collection, mini-sewerage plants etc, with state-of-the-art technology, under West German technology.

Addressing newsmen at Hyderabad during the AP dealers' conference on December 24, Mr. Pravin V. Sheth, the Promoter-Director of the Group stated the new products would be made, using spirally wound technology in contrast to the rotational moulding, which was outdated but was currently employed by all other manufacturers in the country. The new process lent more strength to the products and also saved lot of material, Mr. Sheth said. These pipes and tanks had export potential too.

Reverting to group activities, Mr. Sheth stated, during the year 1989-90, turnover was expected to cross Rs. 100 crores with an all India network of over 400 dealers. The two sick units taken over by the group, Kusum Plasto Private Ltd. at Tarapur, Maharashtra and Jaljivan Plastics Private Ltd., Ahmedabad were modernised and doing well.

Bhama Pipes and Fittings Ltd. has now emerged as the number two company in PVC pipes manufacture in the country. With steady order book position and with a professional board of directors that includes Mr. V. Rajadhyaksha, Mr. Vasant Sheth, Mr. R. Banerji and Mr. C.J. Dadachanji the company will continue to strive with products of high quality, Mr. Sheth said.

REPLACE EXCISE DUTY WITH TAX PLEAD SSIs

A powerful plea has been made to the Union government for replacing the levy of excise duty on the small scale industries sector with levy of a slab-system based tax.

In a pre-budget memorandum to Mr. Madhu Dandavate, the Union Finance Minister, the Bombay Small Scale Industries Association has urged that, alternatively, the government should raise the excise duty exemption limit to Rs. 75 lakhs uniformly on all the small scale units, irrespective of whether they are registered with the state directorate of industries, what they produced or what was the end-use of the product.

Releasing the copy of the memorandum to the press, Mr. Mahendra Singh Bhatia and Mr. Rakesh Pal Abrol, the association's president and secretary respectively, also urged the government to exclude the cost of raw materials for the purpose of computing the excise duty exemption limit in respect of job work units.

They pleaded that the licensing control should start at 98 per cent of the exemption limit of only the ongoing financial year, not the previous year. And the system of filing declaration by the small-scale industries units should be done away with. Besides, the criterion for classification of a product should be the nomenclature of the product and not the end-use of the product, they pleaded.

The association also pleaded that (a) the modvat credit should be equal to the excise duty paid, and nothing more, (b) duty assessment should be made automatic on the basis of invoice value and not of price list, (c) notifications 223, 224 and 225/87 pertaining to duty exemption to branded products made by the small units should be scrapped and (d) the power delegated to the government in 1986 to issue notifications should be withdrawn. The power is being misused, the association felt.

MRL SUBMITS REP
PROPOSALS

The Madras Refiner
has submitted a deta
report for setting up faci
tillation of 500,000 ton
of crude oil and separ
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associated gas in the C

The Petroleum Min
Gurupadaswamy said t
was estimated to cost R
At present there is no p
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The LPG available from
unit will be bottled in the
at Tuticorin, he added. M
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salmer basin, OIL also p
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Eighth Plan.

DOUBTS ABOUT AO
DISPELLED

The Chairman of C
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Dr. B.P Godrej, has sai
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Mr. S.M. Datta, Vice-C
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FENNEL WILD
GERANIUM
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OAK, MOSS, ABSOLUTE
ORANGE EXPRESSION RED, SWEET
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PENNYROYAL 80/85% Pulegone
PEPPERMINT H. MITCHAM CRUDE
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THYME RED 45/50% ph. thymol
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MMA AGM

Associations role lauded

naugurating the Annual General eting of the Indian Chemical Merants and Manufacturers Association Saturday, the 16th December 1989, ri T.C. Dutt, Chief Secretary to the overnment of West Bengal, observed at the present industrial scene in West engal, in light of Haldia Petrochemals Limited, indicated a definite shift wards progress. This was a right time review the situation and take appropate steps with a view to retrieving the ast position.

Shri Dutt was of the opinion that est Bengal was in the brink of a great volution when actually the Haldia Petchemicals would be on stream. He felt at lack of modernisation and various her drawbacks actually made the nall scale chemical industry sick. This dustry should avail the opportunity of frastructural facilities provided by the overnment for the downstream at aldia. He appreciated the role of the ssociation for last 45 years for the evelopment of the chemical trade and dustry in West Bengal.

Shri R.P. Goenka in his address as the hief Guest observed that the Petrohemical Industry now-a-days occupied very important role and was poised for forward thrust. Haldia Petrochemicals imited, foundation of which was laid n 15th October 1989 would play a vital le in the development of West Bengal. hri Goenka assured that within two to ur weeks the West Bengal Governent would start the progress of Haldia etrochemicals. He stressed on the serus need of second generation down tream units at Haldia which might be ought of by the small scale chemical dustries.

He made an observation comparing e progress of the Western Region with at of the Eastern Region in regard to e chemical industries. He criticised the mall scale chemical industry in West Bengal for not adopting the latest technology as well as research and development measures. In this connection, he observed that the entrepreneurs in West Bengal did not improve their position after 1920 for which they had landed in such deteriorating position. Shri Goenka observed that small and medium scale chemical industries would be given a package of incentives to be provided by the Government of West Bengal in the light of Haldia Petrochemicals Limited. He observed that biggest investment he had made in his life was indeed Haldia Petrochemicals.

Shri A.G. Bhanshali, in his Presidential address, emphasised the need for mutual co-operation and trust between the Government and the industrial and trading community for rapid growth of the small scale units just as those in Gujarat, Maharashtra and Tamil Nadu. The cumulative effect of uncontrolled inflationary trend, spiralling price of essential commodities, decreasing employment generation and comparatively low growth rate of production had brought the country on the verge of a critical situation.

He felt that small scale units could generate wealth and employment possibilities at a lesser capital investment. Shri Bhanshali felt that Haldia Petrochemicals Ltd., in the joint sector would change the industrial scene of West Bengal. Citing the various problems of the small scale chemical industry in this region, Shri Bhanshali observed that country's taxation system did not provide much incentive for savings in the corporate sector which deserved to be modified to enable the industry as a whole to generate more savings.

There was urgent and imperative need to rationalise sales tax structure so that the industry and trade in West

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Bengal were not placed at a disadvantageous position vis-a-vis their counterparts in other states. The freight equalisation policy directly helped other states to develop industrially but the traditional industry in West Bengal was languishing with technological obsolescence. Significantly, the facility of freight equalisation was not available to other important raw materials including basic chemical raw materials.

Shri Bhanshali criticised the revision of tax payable to the Calcutta Municipal Corporation on profession, trade and callings at higher rates which had brought avoidable hardship to the small scale industry and trade. He also requested the Government to arrange for industrial estates inclusive of small scale industries somewhere in the suburb of the city with infrastructural facilities in line with Western Region of the country.

In conclusion Shri Bhanshali observed that various taxations, transport bottlenecks, lack of proper infrastructural facilities as well as lack of local entrepreneurship had brought the small scale chemical industry in this region in a problematic state.

Shri R.P. Goenka and Shri T.C. Dutt answered a series of questions from the audience pertaining to Haldia Petrochemicals. Shri A.R. Poddar, Vice-President, proposed a vote of thanks.

REFRESHER COURSE IN UV-VISIBLE AND IR SPECTROMETRY

The Department of Chemical Technology, University of Bombay is organising a four day refresher course in UV-Visible and IR Spectrometry, between February 26 and March 1, 1990.

Fees for the course is Rs. 1,000 per participant. Interested persons in [illegible] biodata: Prof. T.S. Varadarajan, Department of Chemical Technology, Matunga Road, Matunga, Bombay 400 019, before January 25, 1990 for their details.

RAMESH BROS. GET-TOGETHER

A small get-together arranged by M/s. Ramesh Bros. to felicitate Mr. S.G. Hakim, Executive Vice President of Indian Organic Chemicals was held at Hotel Rivera, Ahmedabad on 20th Nov. 89. Prominent personalities from the dyes, chemicals, rubber chemicals industries gathered on the occasion.

Indian Organic Chemicals are the leading manufacturers of various alcohol based chemicals and polyester staple fibres with plants at Khopoli and Manali. M/s. Ramesh Bros., under the dynamic leadership of Mr. Ramesh F. Shah is the leading marketing organisation in Ahmedabad with branches at the important places in India. They are one of the important dealers of IOC products. The company has done a commendable job in marketing and popularising IOC products.

Speaking on
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Mr. S.G. Hakim, Executive Vice President of IOC addressing the [illegible]

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Cetex Petro plans MEK plant

Cetex Petrochemicals Ltd., promoted by CTL Investment Limited, a subsidiary of Ceat Tyres Limited belonging to the RPG group, is coming out with a public issue of Rs. 288 lakhs equity of Rs. 10 each for cash at par and Rs. 84.5 lakhs to Ceat shareholders on January 31, 1990 to part finance the proposed methyl ethyl ketone (MEK) project near Madras.

According to Dr. K.K. Maheshwari, president of the Cetex, the funds would be for part financing the Rs. 18.5-crore MEK project, slated to commence production in March 1990. The plant's capacity is 4000 TPA. The company has signed a collaboration agreement with the Edeleanu of West Germany, a leading company in the manufacture of MEK and other petroleum products.

MEK is an extensively used import substitute and a versatile petrochemical solvent in various industries, mainly in lube oil, magnetic tape, printing ink, rubber, varnish, pharmaceuticals etc.

The basic raw material for MEK is butene-rich LPG, which the Madras Refineries Limited (MRL) has agreed to supply regularly and for which a pipeline has also been laid. The MRL is setting up a "dedicated facility" for this purpose, according to Mr. R. Kothandaraman, general manager, Cetex, which is expected to be commissioned in February 1990.

This fully automated plant, with the latest electronic control devices, is expected to function at 70 per cent capacity in the first year and reach 90 per cent, in the third year of operation. At optimum capacity utilisation, the turnover is expected to be around Rs. 20 crores, profit after tax is estimated at Rs. 300 lakhs. The cash break-even of the project is around 31 per cent and the net break even is at 52 per cent.

The company sources said that the company had already commenced market seeding and the response was encouraging. The collaborators have agreed to lift 1000 TPA for exports (which will be equivalent to 25 per cent of the installed capacity) at internationally competitive prices.

With the anticipated market for MEK in 1990 above 5000 MT, Cetex is assured of a good market. A growth of 12-15 per cent per annum is expected as major expansions are on the anvil in the lube oil, dewaxing, magnetic tape and polyurethane adhesives industry.

MEK has not yet been indigenously produced. Its usage so far has been confined to those industries where alternate solvents could not be used. The import of MEK during 1988 was
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OIL OUTPUT TO BE S

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Gunapalaswamy said. T
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In reply to another
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ONGC has discovered
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basins in 1989-90, he sa
119 structure of South
about 1.5 billion cubic met
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vernments in Pune (January
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g countries of which biomas
n important constituent.The
ference, which will be chaired
Maheswar Dayal, secretary,
nt of non-conventional energy
Government of India, is
to highlight, among other
he role of non-governmental

organisations in intensifying the propogation of the lessons of the biogas experience so far, with particular emphasis on what India had to offer in terms enlarging the technology in relation to serving the needs of rural areas more effectively. The German city-state of Bremen is also associating itself with the deliberations of the conference as also organisationally by virtue of its ongoing project plans in India through the Bremen Overseas Research Development Association (BORDA).

Bonn's parliamentary state secretary at the aid ministry (BMZ) Hanspeter Repnik made it clear, that a positive direction for the future for solutions to energy problems that were both economically and ecologically sound, would emerge from the Pune conference, also helping to provide more clarity to development policies of the Federal Republic. "I expect new impulses for a broadening of this energy source which has an important contribution to make towards easening of energy problems in rural households of developing countries", Mr Repnik stated, adding that while the technology was not simple, considerable expertise had been gained hitherto in its understanding and potential, thus paving the way for more concerted action the area. The use and promotion of biogas needed to be advanced by both governments and non-governmental organisations in the common interest of protecting the environment and using resources sparingly, it was pointed out.The Pune conference will also go into the socio-economic as well as the financing aspects of biogas plants, looking at the main target group of farmers, women entrepreneurs and others, and drawing unreliable evaluation and monitoring producers. High-medium-low-tech solutions to varying problems and benefits to the national economy and ecology are some of the other areas of interest to emerge from the meet.

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EMEXCIL to tap new markets

backdrop of substantial
ports during the current
around Rs. 2500 crores
1100 crores) and poised
ambitious target of Rs.
by 1994-95, the Basic
Pharmaceuticals and Cos-
ort Promotion Council
IL) is laying major empha-
astern Europe and South-
markets in coming years.
d in view, the council is
gations to China, Australia
aland.

g this at a meeting of the
nal members of the council,
Deora, Chairman, said that
ars Indian products were
ed to China through third
he visit of a high-level dele-
China a few months ago
d up the gate for direct co-
nd it was expected that
rters now would be able to
y with the Chinese clients,

nificant to note that the
IL members have already
bstantial growth in exports
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months exports stood at
res. Being encouraged with
upswing, the CHEMEXCIL
an ambitious target of
crores for the Eighth Plan
000 crores by the turn of the
Compared with Rs. 2,500
ng this year, last year's
at Rs. 1,247 crores against
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sed that the US has emerged
he potential buyers of bulk
h has contributed to a great
he increase in export of this
ny of the Indian exporters
om SSI sector have got reg-
h the US Food and Drug
ion which will definitely
to the exports of bulk drugs
xports of dyes and dye
have increased from
Rs. 214 crores in 1987-88 to Rs. 401 crores in 1988-89, registering an increase of 87%. The CHEMEXCIL chairman emphasised that the total markets for dyestuffs in Japan is estimated to be around Rs. 358.5 crores and the industry is confident to get atleast 10 per cent of this market share within a couple of years.

The council has fixed a target of Rs. 665 crores for the current year which in all probability may be surpassed before the close of the financial year, if the raw materials availability ease further. Mr. Deora pointed out the USSR has emerged as one of the largest market for the council's items. A high-power delegation from Medexport, a buying organisation of the USSR, visited India during July 1989 and placed orders with Indian exporters to the extent of Rs. 275 crores and the delivery is expected to be completed before the close of the financial year.

PRICE REVISION LEAVES ASPIRIN PRODUCERS DISAPPOINTED

Indigenous producers of bulk drug Aspirin are disappointed at the recent revision in the price of their product under Drugs (Price Control) Order. "The hike in price granted is half hearted and does not adequately compensate for the substantial increase in cost and lower capacity utilisation", according to industry sources. The department of chemicals and petrochemicals under the Union ministry of industry, through a recent order has raised the maximum selling price of bulk drugs Aspirin to Rs. 90 per kg. from Rs.71. Aspirin is one of the widely used analgesic. It is largely used in various pain killer tablets such as Aspro, Anacin, Disprin, Stopache, Penjon etc. There are four manufacturers of Aspirin in the country with an installed capacity of 4,500 tonnes per annum.

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Promising outlook for pharmaceutical units

The pharmaceutical industry is increasing significantly its output and sales with the implementation of modernisation and expansion schemes. The liberal pricing policy also has been helpful in improving profitability and it is expected that the performance of the established units in 1989-90 will be highly gratifying.

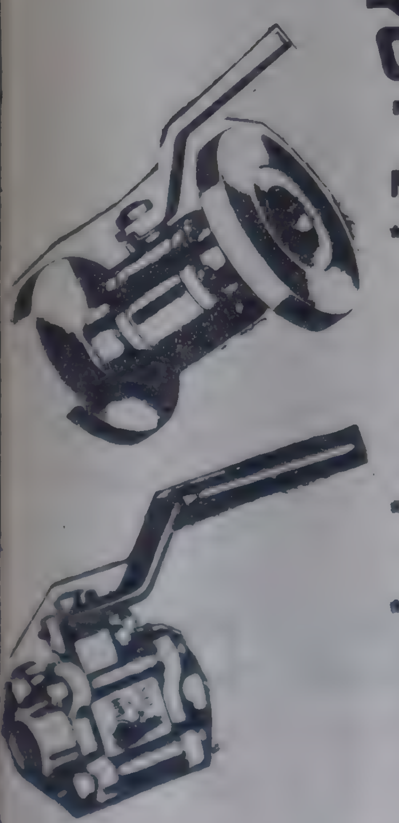
The working results of Glaxo, Hindustan Ciba, Hoechst, Ranbaxy Laboratories and others for the half year ended September 30,1989 give rise to optimism about the immediate outlook. Proctor and Gamble too has been enlarging its turnover and profits with a big increase in the offtake of health care products. The expectations of higher dividends and even issue of bonus shares by some companies have been responsible for the sharp rise in prices for popular scrips.

Sharp rise in equity values: Hectic actitivity has been witnessed in Hindustan Ciba with its quotation jumping to Rs. 1,435 from Rs. 880. While the working results for the six months ended September 30, 1989 have been encouraging, it is being speculated whether there will be any bonus issue by the company. Reserves stood at Rs. 40.07 crores, including capital reserve of Rs. 170.35 lakhs, at the end of 1988-89 against the equity capital of Rs. 17.71 crores. No bonus issue has been made by the directors since the equity shares were listed on the stock exchange.

Hoechst India, likewise, has been hotly favoured with its rate at a new peak of Rs. 2,010 against Rs. 880. The working results for 1989-90 should be highly impressive judging by the progress made so far. A dividend of 20 per cent, taxable, was paid for the 15 months ended March 31, 1989 absorbing of Rs. 1.91 crores out of the net profit, after taxation, of Rs. 4.06 crores. The amount was thus covered two times by disposable profits.

Glaxo has improved to Rs. 101 from Rs. 94.50. It had ample reserves of Rs. 46.07 crores on March 31, 1989 against the equity capital of Rs. 20 crores. A dividend of 20 per cent, taxable, was paid for the nine months ended March 31, 1989. It remains to be seen what decision the management will take in respect of bonus issue as the activities of associated companies also are proving to be helpful.

Ranbaxy Laboratories has been achieving spectacular growth in output and sales and its equities are popular at Rs. 103.75 against Rs. 92.50. The last bonus issue was, ofcourse, in 1988 in the ratio of two shares for every five equity shares. May and Baker has spurted to Rs. 76 from Rs. 60.63 and Pfizer to Rs. 95.50 from Rs. 66. It is therefore, being discussed in market circles what will be the decision of various managements in respect of the distribution of profits and capitalisation of reserves.



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OIL INDIA STAKE IN PAPUA NEW GUINEA VENTURE UNDER STUDY

The Petroleum Ministry is considering a proposal of Oil India to acquire a stake in an existing oil exploration and production venture in Papua, New Guinea. Premier Consolidated of U.K. is holding a contract for exploration and production in the area. About 60 per cent of stake in the contract is being offeered by it for sale to other interested parties. Oil India has, however, proposed to acquire only 30 per cent stake in the venture. This would mean that Oil India would have to put in about $10 million in the venture. The government had earlier allowed ONGC Videsh to acquire a stake in an exploration and production sharing contract in Malaysia by buying the stake partly held by Agip (Overseas) of Italy.

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Pollution control board should be upgraded: expert

The Task Force on Environment of the Eighth Five-Year Plan has suggested to the Tamil Nadu Government to strengthen and develop the Pollution Control Board by drafting the services of professionals and naturalists in checking environmental degradation, according to Dr. M.S. Swaminathan, president, International Union for Conservation of Nature and Natural Resources (IUCN).

Inaugurating a two-day exhibition on "City waterways" organised by the Worldwide Fund for Nature-India and Madras Naturalists Society at the CLRI Kendriya Vidyalaya, Adyar, he said the Board could be upgraded as a protection and promotional body with more powers, on the lines of Environmental Protection Agency (EPA) of the United States.

Dr. Swaminathan, who heads the Task Force, said people's involvement was imperative in such a stupendous task, and small groups should be set up in villages and towns which would be feeding the apex body with information on the various pollution problems. Setting up of a technical advisory group with eminent persons drawn from academia, ecology and civil engineering would help the Board to a great extent in solving the problems.

Dr. Swaminathan said the youth power should be channelised to check the deleterious effects of pollution by helping them to organise neighbourhood groups to learn about nature and contribute their mite for creating clean environs. Awareness through action programmes among youth and children brought them to the vanguard of the movement to prevent any abuse of the and. "Children should be the watchdogs of society for clean environment".

Dr. Swaminathan said environment was not the business of the government alone. Micro organisms had been poisoned, toxic and plastic wastes had increased and pollution grown. He said environmental courts suggested by Mr. Justice Bhagwati, should be established in cities and towns to check the offenders. He appealed to the students to participate in the eradication of mosquito programmes in the city.

Mr. M.V.I. Rajan, president, Madras Naturalists Society, welcoming the gathering, said that a campaign had been launched for a cleaner and healthier Madras which was possible only if the terrible cesspools of waterways were cleaned up and made fit for the habitation of aquatic life.

Mr. Preston Ahimaz, Se of the Worldwide Fund India, said the WWF-I ha massive campaign to cle waterways of the city — the Adyar and the Buckinghar a first step, school childre involved in the creation and motivation programm help of nature clubs.

GAS-BASED MAGNESI JECT FOR TRIPURA

A Rs. 60-crore magne project with an annual capa tonnes, based on Japanese will be set up near Agartala cutta based Ispat Alloys L project will not only be the private sector venture in Tr has abundant natural gas re will also be the first to pr nesium metal in the count

According to Mr. M.R. utive Director of the co import substitution project commissioned by the midd The company has signed a dum of understanding with Company of Japan. The tech critical equipment for the pr supplied by Ube Industries Japan.

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ss on chemical engineers' role

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as urged by the 42nd
of the Indian Institute of
eers (IIChe) which con-
ndrum in the third week

ld delegates to this
ntion felt that chemical
not given their rightful
planning process of the
so in areas like industrial
n control etc. where they
e role to play.

alist, Mr. Vijay Mallya,
he UB group, who inau-
sion said the Government
n the expertise of the pro-
en charting out policies.
policy makers were not
ake decisions.

emphasised the need for
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stitute as a consultative
d be invited to participate
ssions on chemical indus-
the Government to issue
ness in the form of a
" on the industry. This
y to give it proper direc-
owth.

h of the chemical sector
ost other ancillary indus-
n a white paper the direc-
e of the government
d be made known. The
ident, Dr. P.V.S. Nam-
essed the need for better
and interaction between
tutions and the industrial
the country could get the
the chemical engineers.

D FOR NYLON 66

versial nylon-66 project proposed to be set up by Du Pont of the US and the Thapars has been cleared by the Monopolies and Restrictive Trade Practices Commission. The clearing has not yet been officially announced but sources handling the joint venture have been told by Ministry sources that it is through.

The proposal is now before the Projects Approval Board which would meet shortly. This is another confirmation that the project has received the MRTPC clearance because PAB normally comes into the picture only after the MRTPC gives the green signal for the project application.

The Thapar-Du Pont joint venture to make nylon-66 was floated about two years ago but has met with stiff opposition ever since. The original proposal was shot down by the MRTP Commission earlier last year.

The project is seen by many as an opening gambit by Du Pont for entering India. That is why both the partners have stuck to the difficult job of convincing the Government and various industry lobbies that the project is sound and does not jeopardise the interests of existing producers of nylon 66. The project was originally supposed to cost Rs. 180 crores but current revised cost is around Rs. 250 crores.

INDUSTRIAL OUTPUT INDEX UP

According to quick estimates the general index of industrial production, base 1980-81, for September stood at 182.5, which is higher by 6.1 per cent as compared to the corresponding month last year.

The average index for six months ending September stands at 179.4 which is higher by 4.1 per cent as compared to 172.3 for the corresponding period previous year.

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Drug research and rural health

Addressing the Indian Pharmaceutical Congress in Bombay, the Union Minister of State for Science and Technology, Prof. M.G.K. Menon, took the drug industry to task for neglecting the development of tropical medicines through research & development. In a tropical country like India the industry is expected to gear its R and D to tackle tropical diseases such as amoebiasis, intestinal worm infections, leprosy, tuberculosis and filariasis. Unfortunately, the industry's research programme is designed to tackle cardio-vascular diseases, cancer, infections and neurological problems.

The Government must share the blame for this unhappy state of affairs. The drug pricing policy adopted by the Government has, over the years, undermined the financial strength of the industry, so much so that the industry has lamented that "Government financial" institutions, which provide a substantial share of funds required for industrial development and growth, are increasingly becoming reluctant to fund expansion of the drug industry because of its low profitability.

Moreover, the cost of discovering a new drug has soared to Rs. 50-70 crores. The Government is anxious to control the prices, among others of tropical medicines as the purchasing power of their users is relatively low. In the circumstances, it is not surprising that the industry has only a modest R and D programme, and that too is geared to cure diseases of those people who can afford to foot the bill. It is possible that the industry will adopt a more positive approach to research on tropical diseases once it is enabled to strengthen its financial basis. Till then, however, the Government and the industry will have to intensify their efforts to improve the availability of drugs in rural areas. The Secretary to the Union Ministry of Health, Mr. R. Srinivasan, naturall underlined the need to strengthen th network of primary health centres.

The Union and State Governmen ought to address this issue with the hel of the industry. The Government ha neglected studies on the pattern of dis eases in relation to groups of people i given rural areas. The absence of thes epidemiological data handicaps th industry. This ought to be looked int for improving the health of rural people No less urgent is the need to suppl clean drinking water to them. This wil dramatically reduce the high inciden of water-borne diseases in rural areas

The Government can also help bot rural and urban people by reducing th burden of taxes and duties on drugs Prof. Menon exhorted the industry supply drugs at affordable prices. Thi is however, easier said than done, con sidering that the industry is unable secure reasonable margin of profit. I fact, the industry's profit before tax a a proportion of sales declined to abou five per cent in 1987-88 against 11.7 pe cent a decade earlier. This only show that the Government will have to giv tax relief to the industry if drug price are to be lowered.

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OPAL ACT VALID

SC confirms $470 m. settlement

Constitution Bench of the Supreme
rt upheld the validity of the Bhopal
Leak Disaster (Processing of
ims) Act, 1985, and thus confirmed
$470 million settlement of all claims
inst the multinational Union Car-
e.

The five-judge Bench, in three sep-
te but concurring judgements,
ected the Government of India to
ntinue to pay interim compensation to
victims. The Chief Justice, Mr. Sab-
sachi Mukherji, in his judgement,
ich he delivered along with Mr. Jus-
e K.N. Saikia, observed that "no
eful purpose would have been served
giving a post-decisional hearing in
case".

Mr. Justice K.N. Singh, in his sep-
te judgement, agreed with the main
dings of the other judges, and sug-
sted to the Government the setting up
"a statutory funds of permanent
ture" to give quick relief to victims
national disasters.

More than 3300 people were killed
d about two lakh affected in the
rld's worst industrial disaster on
cember 3, 1984, when deadly MIC
s leaked in huge quantities from the
ion Carbide's Bhopal plant.

Mr. Justice S. Ranganathan and Mr.
stice A.M. Ahmadi, who gave the
rd judgement, also concurred with
er members of the Constitution
ch which was set up barely two
eks after the February 14 order of the
preme Court, announcing the
70-million settlement.

The Chief Justice, Mr. Mukherji
served in his judgement: the
pupunged) Act was conceived on the
ble promise of giving relief and suc-
ur to the dumb, pale, meek and imp-
erished victims of the disaster. "The
t is constitutionally valid".

"It proceeds on the hypothesis that the initial claim of the victims are realised or obtained from the delinquent multinationals — Union Carbide Corporation and Union Carbide of India Ltd. — by settlement or adjudication or any other proceeding".

On the question of notices required to be issued to the victims under Section 4 of the Act, the Chief Justice said, "in the facts and circumstances of the case, no useful purpose would have been served by giving a post-decisional hearing", Mr. Justice K.N. Singh in his judgement suggested to Parliament enactment of a legislation to set up a national disaster relief fund to give speedy compensation to the affected people.

The impunged Act gave the Government of India sole authority to represent all the gas victims. Soon after the settlement order, the compensation case got bogged down in a cobweb of legalities and a Bench was set up by the then Chief Justice to decide the validity of the Act, under which the settlement was arrived at.

The judgement was reserved by the Constitution Bench after hearing for several weeks the five petitions, filed as public interest litigation. The key petition, filed by the Advocate, Mr. Charan Lal Sahu, challenged the constitutionality and legality of the Act contending that the Government could not have "usurped" the right of the victims to go to court. Of the other petitions, two were from gas victims associations and two from lawyers known for advocating the social welfare cases. One petition urged the court to direct the Union of India to pay the difference between $3 billion, which the Government of India originally used for, and the settlement of $470 million.

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New pricing norms may hit fertiliser units

Almost all fertiliser units in the country are likely to suffer severe losses this year due to changes in the pricing and depreciation norms recently introduced by the Union Department of Fertilisers. Industry sources pointed out that several units, including the public sector ones, are already facing a liquidity problem and nil-profits this financial year. This may seriously affect new investments in fertiliser units.

The newly-commissioned bigger units, particularly the ones on the HBJ gas pipelines, are said to be worse affected. According to indications any profit making by these units and subsequent redeployment of profit in newer units are ruled out. This predicament is the result of a government order lowering the plants depreciation rate from 10.75 per cent to a mere 4.75 per cent. The basis for fertiliser retention price and subsidy are calculated on this depreciation.

Earlier, this eligibility for depreciation was based on an assumed ten year life time for the plant and machinery. It has now been raised to 20 years by which time most fertiliser plants become aged and sick. The sources pointed out that the new fertiliser may find it difficult in this situation even to repay the loans they took from public financial institutions.

Though the previous Government had promised to review the latest pricing and depreciation norms, it had not done anything till the end of its tenure, the sources added.

The financial problems being faced by the fertiliser units may look paradoxical when one takes into account that both the 1988-89 fertiliser production of 8.9 million tonnes and consumption of 11 million tonnes were records.

Though the quantum leap of 2.3 million tonnes in fertiliser consumption during the year to take the total to 11 million tonnes was commendable, it is still short of the consumption target of 12.2 to 13 million tonnes fixed for the terminal year of the Seventh Plan (1989-90).

The actual consumption in 1989-90 is expected to be only 11.6 million tonnes, according to the estimates made by the Fertiliser Association of India.

The sources said there is an urgent need to create additional fertiliser production capacity, particularly in nitrogen fertilisers. So far no new capacity is envisaged for the Eighth Plan. If these issues are not tackled immediately, more fertiliser imports will have to be made further draining on the precarious foreign exchang
said.

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Duty waiver holds key to Essar sponge iron plant

Essar Gujarat is in a bind. Its first phase 8,80,000 tonnes per annum sponge iron plant at Hazira can be a viable proposition only if the Government waives import duty of 85% on all pellets' imports from world markets or bought from the Government-owned 100 per cent export-oriented unit, Kudremukh Iron Ore Company Ltd.

Essar Gujarat has made a strong plea for waiver to facilitate imports of pellets at around 48 cents per iron unit, the world price at which Kudremukh plans to sell pellets. An 85 per cent import duty could make the project non-viable at a time when the original cost of Rs. 305 crores has shot up to around Rs. 400 crores.

For the Government, an exemption could strip Kudremukh of the technical status of an export-oriented unit as it will then have more freedom to sell in domestic tariff area. Of course the 25 per cent export obligation will remain. The company has quoted a notification stating that any sales in domestic tariff area can attract import duty equivalent to excise duty.

A second notification states that excise duty is not leviable on mineral ores, forcing one to conclude that pellets from Kudremukh should neither attract import nor excise duty. The company is awaiting the Government's okay of its interpretation soon as its first sponge iron plant is scheduled to start production from March.

Of course, the company could force the issue and the Government is aware of the ploy. The sponge iron plant based on gas, utilises Midrex technology of Midrex Corporation, the US. The Oil and Natural Gas Commiss supplying gas at the land-f Rs. 1,400 per 1,000 cubic

The company has plans capacity of sponge iron help mukh utilise its full cap three-million tonnes per an plant is presently utilising of its capacity and there are p capacity to six million tonnes following demands from lo iron units.

If Kudremukh plant gets exemption, it will have to tically extended to the Man plant of the Chowgules wh down in 1981 and is expect as a 100 per cent export or The Chowgule plant capac 1.8 million tonnes per ann

CEPHAM ORGANICS

Cepham Organics Ltd. h improved results for the s period ended September 30. increase in turnover at Rs. as against Rs. 4.86 crores i period last year and net Rs. 21.20 lakhs as against lakhs.

The company is currently ing its expansion programm Rs. 80 lakhs on completion production capacity will rise cent. It is also venturing int bulk drugs from this month. pany hopes to achieve a Rs. 14 crores in the current y March 31, 1990.

LEPROSY CONTROL: G AWARD FOR TWO DOC

Dr. M.F. Lechat, a lead iologist from Belgium an Wardekar, a pioneer in intro rosy control programme on scale in the country, have be for the international Gandhi 1990.

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GMDC to go ahead with plans

rat Mineral Development (GMDC) has decided to go its plans for introducing its ng and distribution arrange- gnite mined at Panandro and espite strong protests from such as Gujarat Chamber of and Industry.

ative GMDC sources said ew arrangements which are erned on the distribution of vital for the profitable work- orporation and firmly denied w system will either result in price or in the shortage of

rces said the mine at Panan- tch district and Rajpardi in strict have been developed investment about Rs. 100 e interest liability on the loan t of the investments works out rores a year. The servicing of d the provision for deprecia- h a magnitude required much es than now. The expansion e now on hand with GMDC an an annual output of addi- 7 lakh tonnes of lignite per would be double the amount C would have to sell than s doing now. As lignite was and could not be stocked for rger marketing arrangement escapable necessity.

g the GMDC's present ent for marketing of lignite no intermediaries, it was only informally a number of agents lved in its sales and the cor- d been selling lignite against orders furnished by such e sources said that in its view e easier to operate through a network than 800 odd deli- rs when quantum of lignite to ould be substantially large in . There was no bar on existing agents becoming distributors provided they satisfied the conditions laid down for the grant of distributionship.

The need for a new marketing network had become all the more urgent because the second unit of the proposed 70 mw power station at Panandro based on lignite was unlikely to take off in the near future. The first unit is scheduled for commissioning in March next year. These two units are expected to consume 6.5 lakh tonnes of lignite a year and till both the units are on stream, the problem would be to sell the lignite already mined.

According to the Gujarat Chamber of Commerce and Industry the GMDC's proposal envisaged a grant of monopoly to few distributors and stockists and this would lead to exploitation of consumers in as much as they would have to pay higher charges for transportation, handling and commission. When the present system of distribution of lignite directly to consumers was operating smoothly there was no need to replace it with a new one, it said. The consumers of lignite in the state are textile industries, processing industries, oil extraction industries, cement industries and heavy chemicals. Lignite is used as a replacement for coal to the extent of 20 per cent of consumption.

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Work begins on JK's Saleempur plant

The Delhi-based JK Synthetics group has begun work in earnest on its Rs. 1,250-crore Saleempur petrochemical complex by tieing up with the American conglomerate, UOP, for its aromatic complex.

Negotiations are currently on with ICI of UK, Mitsui of Japan and Amoco of the US for technical and financial collaboration for the downstream purified terephthalic acid (PTA) plant. Informed sources claim that Amoco is likely to emerge as the final choice. The tie-up will be signed shortly.

Project work is slated to start this month. The complex is scheduled to go on stream by the last quarter of 1992. A memorandum of understanding (MoU) will also be signed shortly with IOC for supply of 3.5 lakh tonnes of high grade naphtha from the Mathura refinery. IOC has agreed to set up a splitting plant for the naphtha in Mathura at a cost of around Rs. 35 crores. This would save JK the trouble of laying an additional pipeline between their complex and Mathura refinery.

The group has acquired 850 acres of land from the UP government — a site that is 55 km away from Mathura refinery. Water and power supplies have been tied up and the green signal from the state pollution board has come through. Necessary central clearance, for capital goods and the MRTP Commission, have also been obtained.

The pattern of financing envisages a conventional debt-equity ratio of three to one. International financial institutions and its financial and technical collaborator would take care of a major chunk of the debt element. The instrument for mobilisation of the equity has not yet been worked out, but is likely to be in the form of convertible debentures, with the call money and conversion to be timed with e
funds and generation of
separate company, J.K. P
Ltd., has been launched f
Plans to float the complex
Synthetics were dropped w
tion of foreign equity parti
up. It was also felt that
unfair to burden the exis
with the onus of an additio
capital base.

The aromatic complex
facture three basic compo
zene, orthoxylene and pa
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several major consumers o
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which would not be diffi

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Scramble for Haldia project

dia petro-chemical complex
raiting the Central Govern-
arance for the last 12 years,
ly become the most sought-
ct for several front-ranking
ts in the country. One indu-
candid enough to admit that
e in the government at the
ad made him interested in
in the West Bengal project.

t in the Haldia project was
n October when the former
nister, Mr. Rajiv Gandhi, on
the announcement of the Lok
ctions suddenly decided to lay
dation-stone for the project
inalisation of its design, size
cial aspects. Mr. Gandhi per-
the state chief minister,
u Basu, to accompany him to
rom Delhi for the foundation
y.

g was heard about the project
and Mr. Basu told election
that he was convinced it was
ther election gimmick by
dhi.

the minority National Front
ent came to power at the
th the support of the BJP and
Front, there was a general
on in West Bengal that the
utstanding industrial projects
h the Centre, particularly the
etro-chemical and the Bak-
hermal power projects, would
ve an early clearance.

bout the chances of Central
for the projects on his return
ta from Delhi after the forma-
e new Union council of minis-
Basu scoffed: They have more
things to do at this moment."
equent developments make one
hat Mr. Basu was being diplo-
t day. The first inkling of the
hanging developments about
is project came to light on
December 12, when Mr. Tapan Sikdar, the general secretary of the West Bengal unit of the BJP, stated that the CPM was trying to associate the Ambanis of the Reliance group in the downstream projects of the Haldia complex because of their reportedly close links with the chief minister's son.

The following day, the state's finance minister, Mr. Asim Dasgupta, admitted that apart from the R. P. Goenka group, the original co-promoter of the joint sector Haldia Petro-chemical Limited, the state government had started negotiations with several other industrialists, including the Ambanis. He said this had become necessary as the cost of the project had gone up from the original Rs. 428 crores to Rs. 3,000 crores because of the delay in the clearance and also because of doubling the size of the naphtha cracker plant.

When the joint sector Haldia project was set up in 1985, its cost had already touched Rs. 1,470 crores. But the Centre refused to give it clearance on the plea that the naphtha plant with a capacity to produce 139,000 tons of ethylene would not be economically viable.

Thereafter, following negotiations and reviews, it was decided earlier this year that in order to make the project economically viable, the project would be upgraded with the naphtha cracker plant's capacity raised to 250,000 tons and the cost, consequently, going up to Rs. 3,000 crores.

Mr. Dasgupta said that as the government was keen on starting the project at the earliest, and since the share of the private co-promoter of the joint sector project had gone up with the rise in the cost, investment by other private co-promoters had become imperative to preserve the state's interest.

On December 14, Mr. Dhirubhai Ambani's son, Mukesh, met Mr. Dasgupta, to submit the Reliance group's proposal for investment in some of the downstream projects. Mr. R. P. Goenka and his son, Sanjiv, the original co-promoters, associated with the construction of the naphtha cracker plant and four of the eight downstream units, also met the finance minister. Later, Mr. Mukesh Ambani, Mr.R.P. Goenka and Sanjiv together met the chief minister for a joint discussion on the matter.

The same day, another Bombay-based industralist, Mr. Viren J.Shah, of the Mukand Steel group, who is also the president of Assocham, met the chief minister. The following day, Mr. Shah's two sons, Rajesh and Sukumar, held talks with Mr. Dasgupta with video-projections of their activities in the finance minister's chamber.

Asked whether he was being edged out of the Haldia project, the original co-promoter, Mr. R. P. Goenka, said as long as Mr. Basu was there, no one could edge him out.

On December 16, a local industralist, Mr. M. L. Mittal, on the Ispat group, held talks with the state's finance minister for investment in the project. Later, describing the talks as of a preliminary nature, Mr. Mittal told reporters, that his group was prepared to invest up to Rs. 2,000 crores for any suitable project. Mr. Viren J. Shah also told reprters the same day that his group was prepared to invest Rs. 1,000 crores for the downstream projects.

On December 17, after the chief minister met Mr J.R.D. Tata, Mr. Viren Shah and some other local industralists, Mr. Tata told reporters that he was not interested in the Haldia project and that his interest was in environmental pollution. Mr. Mittal met the chief minister and the finance minister recently and showed video-projections of the firm's capabilities.

Mr. Dasgupta said, that Mr. Bharat

Hari Singhania, of the JK group, and Mr. B. M. Khaitan, of the MacNeil Magor, were likely to meet him in a couple of days for talks on their possible participation in the project. Mr. Raunaq Singh, president of FICCI, who is scheduled to come to Calcutta, might also throw his hat in the ring, it is learnt.

There is thus now a scramble for investment in the Haldia project, while before the election there were no takers for it except for the Goenkas. No doubt, the change in the political scenario at the Centre has made the Marxists acceptable to the industrialists.

Mr. Basu, on his part, said that his government was not concerned whether the project was assisted by the Ambanis or by any other industrialists. "We are only interested in its early implementation." All aspects of the project are likely to figure in Mr. Basu's talks with the Prime Minister, Mr. V.P. Singh, in the first week of January before it is finalised.

KARNAL REFINERY PROJECT: MINISTRY ASKED TO ACCELERATE EXECUTION

The petroleum and chemicals minister, Mr. M. S. Gurupadaswamy, has asked his ministry to sort out any hitch over implementation of the Karnal refinery within a month and to ensure that the project is executed without delay. A press release issued by the Haryana government says the state chief minister, Mr. Om Prakash Chautala, met Mr. Gurupadaswamy at Delhi recently and complained that the Karnal refinery, the foundation stone of which was laid three years ago by the former Prime Minister, has shown no progress whatsoever. He urged the petroleum minister to start the work immediately.

Mr. Chautala also discussed with Mr. Gurupadaswamy the question of
petroleum exploration by t
Natural Gas Commission
Naraingarh, Sadhaura, Mor
hahad areas for which ON
has a licence. The Haryana
ter requested the petroleum
icals minister to ask ONGC
work immediately. Mr. Gur
assured Mr. Chautala that h
call the ONGC officials and
of the action.

The Haryana chief mi
called on the energy minist
Mohd. Khan, and discusse
the problem of Yamunanag
power plant. Mr. Chautala s
ject was handed over to t
Thermal Power Corporati
two and a half years back
gress has been made. The en
ter promised expeditious c
the project.

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participation in equity of S
taken about 1,15,000 share
each at a premium of Rs. 4
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Rs.1,000-cr. gas field underutilised

A massive investment of Rs. 1,000 crores by the Oil and Natural Gas Commission (ONGC) with a 60 per cent foreign exchange component on south Bassein, the country's largest gas field, is proving unviable.

After having commissioned all production facilities, the commission is being forced to slow down the rate of production, rendering half the capacity idle.

The present rate of production from South Bassein is around 12 million cubic metres of gas a day as against the capacity of 20 million cubic metres a day. This is sought to be reduced by two or three million cubic metres a day with the increase in the associated gas production from Bombay High. The Bassein-Hazira pipeline is linked to Bombay High and a portion of the latter's production could be diverted through it.

The government had given ONGC a production target of 18 to 20 million cubic metres of gas a day from this field by the end of the seventh plan. To meet this target, ONGC installed two process complexes, BPA and BPB. The four platforms, living quarters for 250 people and a pipeline to Hazira and Bombay High. South Bassein was expected to feed all the six gas-based fertiliser projects coming up along the HBJ gas pipeline, three power projects and a number of other downstream industries like the Saleempur aromatic project. Three of the six fertiliser projects are still languishing. So is the Kawas power project. The other downstream industries are not expected to come up in the immediate future.

Top ONGC sources say that with the present level of production, the commission is unable to service the loans taken for the project. It is now examining the feasibility of exploiting the thin column of oil in the field. The total oil reserves in south Bassein is put at 100 million tonnes which will enable ONGC to produce at the rate of one million tonnes of oil per annum. This will boost the revenue from the field.

It now appears that the entire investment on south Bassein could have been shelved for a decade had there been a proper gas utilisation policy. ONGC sources acknowledge that 15.5 million cubic metres of gas is being flared every day from western offshore. This is three million cubic metres more than the present rate of production from south Bassein field. In value terms, it works out to Rs. 750 crores per annum. Bombay High produces about 27 million cubic metres a day and satellite fields such as Heera, Panna, Ratna and D-18 about 2 million cubic metres. With south Bassein, the total gas output from western offshore is 41.66 million cubic metres a day.

Total supplies to various agencies like the Gas Authority of India Ltd (GAIL), Tata Electric, RCF, Maharashtra State Electricity Board, Deepak Fertilisers, Bharat Petroleum, Bharat Electronics, and Krishco work out to 23.245 million cubic metres a day. Internal consumption by ONGC accounts fo 2.96 million cubic metres a day. The rest is being flared for lack of demand.

ONGC can slow down production from south Bassein because it is free gas. But in Bombay High it is associated gas, that is, gas coming along with oil, the production of which can neither be prevented or slowed down so long as oil is produced, the rate of flaring will come down in coming years, but gas worth thousands of crores of rupees has already been flared over the years.

With gas-oil ratio (GOR) going up with the depletion of the field, Bombay High is expected to produce more associated gas in future. The GOR has gone up from 100 to 450 (volume by volume) and advanced planning for gas utilisation was not taken when ONGC embarked on accelerated oil in the early 80s.

FERTILISERS, PETRO
SHARP RISE IN IMPOR

There was a sharp incr value of imports of fertilis steel, petroleum and petr ducts, in April-August ov period last year.

According to the commodity-wise import-ex increase of 182 per cent in value of fertiliser was reco was Rs. 705.54 crores com Rs. 250.23 crores in the months of the last financ

The total import bill for A was up by 18.5 pe Rs. 12,797.56 crores again crores in the same period

The import of petroleu eum products showed an 19.3 per cent at Rs. 2,1 compared with Rs.1,794.

The import of organic a chemicals, however, dec nally to Rs. 703.97 crores crores.

On the export fron recorded considerable g exports during this period by Rs. 38.1 per cent at crores compared with Rs.

Textile exports, on th forged ahead by 33.8 Rs. 1,909 crores com Rs. 1,426.45 crores

The export of leather facturers rose by 17.6 Rs. 676.4 crores com Rs. 574.96 crores. Export and allied products spur cent at Rs. 968.8 crores c Rs. 543 crores.

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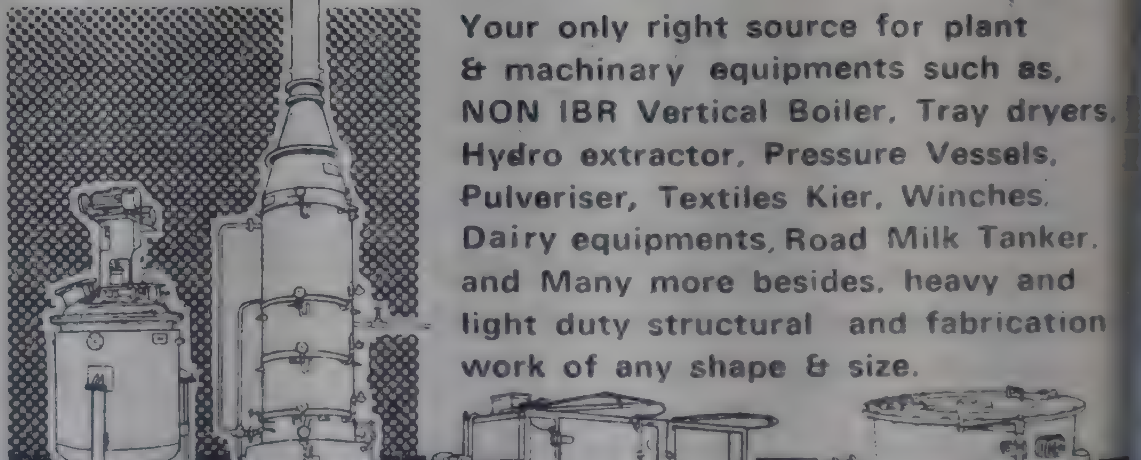

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NGC hikes Cauvery crude output target

l and Natural Gas Commission GC) has raised the production t of crude from the Cauvery basin g the Eighth Plan in view of the ent significant' discoveries of rocarbons in the region.

uch significant strikes of hydrocar- s have been made in the onland and hore parts of the basins. On the basis hese, ONGC has hiked its terminal r target of crude production there for Eighth Plan (1994-95) from two mil- n tonnes per annum to 3.5 million nes annually, official sources said.

Meanwhile, production of crude from basin from April to September 1989 teeply increased'' from 200 tonnes r day in the beginning of April this ar to 700 tonnes daily at the end of e period. The earlier target of produc- n for 1994-95 was two million tonnes r annum, the sources said.

The entire production from the Cauv- y basin is being sustained through the arly production systems'' at Narim- am, Bhuvanagiri, Nannilam and diyakamangalam. The development heme for many of these structures is ing worked out at the Institute of eservoir studies in consultation with e reservoir engineers of the region, the urces said. Drilling was now in pro- ess at five new structures — Kaudayur Needamangalam, Vattikadu, Mongudi and Kotarkudi onland. A number of exploratory locations with similar objectives have been identified after critical review and will be taken up for drilling. The number of rigs deployed in the Cauvery onshore and offshore is expected to be increased to 16 at the end of the Eighth Plan in 1994-95 from the existing ten, the sources said.

The development of the Cauvery offshore structure is also being taken up in a phased manner. A detailed Rs. 325 crore scheme has been prepared for the PY-3 structure in the basin, the sources said.

Rs. 50-Cr. SPANDEX UNIT: PETROFILS TIE-UP WITH JAPANESE CO.

Petrofils Co-operatives Limited has entered into a foreign collaboration agreement with Marubeni and Toyobo Co. Limited of Japan for its Rs. 50-crore spandex plant.

Under the agreement, the Japanese collaborators would supply technical know-how, basic engineering and equipment, as well as supervise detailed engineering construction and commissioning of the plant. The Japanese have also agreed to provide training to technical personnel of Petrofils in their Japanese plant.

The spandex plant, which is expected to go on stream in June 1992, will be the first to be set up in the country. The technology for spandex is generally guarded and difficult to get.

Spandex is an elastromeric yarn with wide applications in elastic tapes, sports wear, socks knitting, medical application, etc. It primarily replaces heat-resistant rubber used in these products.

It is an elastic yarn which retains its shape and size even if it is stretched six times. Unlike heat resistance latex rubber, it can resist higher temperature, effect of sunlight and in chemical inertia. It can also be dyed. The life of garments would be two or three times longer and the garment would retain shape without deformation.

The plant is being set up by Petrofils in the backward adivasi area at Naldhari in Bharuch district of Gujarat adjacent to the nylon and polyester plants.

The nylon-6 plant was commissioned in March. The foreign collaboration agreement for technical know-how, basic engineering and supply of equipment have also been signed. Civil works have just commenced and the plant is expected to be commissioned in 1991.

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Tata Chemicals

Tata Chemicals which ranked 14th among the 101 private sector giants during 1987-88 has recorded peak sales and profits during the year ended March 1989 — the golden jubilee year of the company, the company which pioneered soda ash production, has kept up the leadership over the years in the organised sector. At present, it commands 62 per cent share of the aggregate soda ash production.

Although production of soda ash and other chemicals has been marginally higher than that achieved during 1987-88, most of the plants have reportedly worked at more than 100 per cent of their rated capacity — soda ash plant achived a capacity utilisation of 125 per cent.

The net sales realised at Rs. 226.7 crores recorded an increase of 25.8 per cent over the Rs. 180.2 crores of the previous year. The company achieved record sales soda ash-nearly 9.6 per cent more than the 5.49 lakh tonnes of the preceding year — despite a glut situation in the market. It also registered record sales of sodium bicarbonate —an increase of nearly 69 per cent over the 21,011 tonnes achieved in 1987-88.

During the year under review, the company exported 39,000 tonnes of both iodized and non-iodized vacuum evaporated salt and earned foreign exchange worth Rs. 4 crores.

The company earned gross profits (depreciation plus profits before tax) of Rs. 67.8 crores, arise of 31.3 per cent over the gross profits of Rs.51.7 crores in the previous year. The gross profits before intrerest but after depreciation have also been higher at Rs. 85.9 crores than Rs. 70.6 crores in the previous year. Profits before tax touched a new high at Rs. 50.3 crores (an increase of 42.9 per cent) against Rs. 35.2 crores in the previous year. The profits (after ta at Rs. 35.8 crores showed an improv ment of 31.6 per cent over the prof of Rs. 27.2 crores in 1987-88. Accor ing to the company, 'such record resul consistently achieved year after year f several years now and often in def nance or exceptionally heavy odds, a a true measure of the inherent streng which has been built up in a self-relia manner.'

The gross profits (profits before ta plus depreciation) as a percentage (total capital employed work out highe at 11.75 per cent in 1988-89 than th 10.56 per cent of the previous yea Gross profits as a percentage of net sal have increased from 28.66 to 29.9 However, the profits after tax as a pe centage of net worth work out lower 13.99 than 14.50 mainly because of sharper increase in net worth.

The company paid a dividend Rs. 3.10 per share, against Rs. 3.00 the previous year. The payout ratio ha been stagnant at 39 per cent in both th years. The Rs. 10 paid-up shares a currently quoted at Rs. 115.50 on th Bombay stock exchange. Equity pric moved up between Rs. 113 (low) a Rs. 127 (high) during 1989. Again this, the prices had fluctuated betwe Rs. 56 (low) and Rs. 119 (high) 1988.

The company so far had capitalise Rs. 13.05 crores from resources a issued bonus shares five times in va ious proportions. It also made righ issues four times amounting to 3.1 crores. As a result, the company rank among the top ten private sector com panies in terms of market capitalisatio

The company has proposed to cap talise Rs. 24.59 crores from the sha premium account and issue bon shares in the ratio 1:2 subject to ne essary consents.

The equity-capital of the company at the end of March 1989 stood

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.92 crores and reserves and sur- Rs. 210.93 crores. Loans secured than debentures) and unsecured been Rs. 38.22 crores and 3.52 crores respectively. Deben- and bonds amount to Rs. 127.13 s as against the current liabilities s. 62.60 crores, the current assets loans and advances amount of 184.96 crores. The gross block at 285.59 crores has shown an increase 9 per cent over the previous year. accumulated depreciation has been 121.25 crores.

uring the year under review, Tata tilisers was amalgamated with the npany. The amalgamation will ble the company to enlarge and ersify the operating base at an excep- ially low increase in the share capital.

he book value and earning per share at the end of March 1989 work out s. 58.86 and Rs. 7.97 respectively. price earning ratio has been 14.49.

FC PLANS EXPANSION

he Gujarat State Fertiliser Company SFC) is putting up a new phosphoric d plant with a production capacity of ,000 tonnes per annum. To be ated at Sikka in Jamnagar, it is esti- ted to cost Rs. 300 crores.

The plant comprises part of the ambi- us Rs. 1200 crores diversification and pansion plan of the company.

A new sulphuric acid plant of 1,000 nes per day capacity is also being set at cost of Rs. 28 crores as a part of expansion programme.

The company is also setting up a new prolactum plant of 50,000 tonnes per num at a cost of Rs. 400 crores. The sic engineering work has already been mpleted and civil work is in progress. e plant is likely to be commissioned December 1991.

The company which is the only one to have a melamine plant is going in for a second plant at a cost of Rs. 73 crores. The plant to be located at Baroda will have a capacity of 10,000 tonnes per annum.

Work on the second phase of 25mw capacity steam and cogeneration plant costing Rs. 38 crores is also progressing fast and commissioning is expected by March 1990. The first phase of the plant with 15 mw capacity has already been commissioned at a cost of Rs. 33 crores.

According to Mr. P. V. Swaminathan, Managing Director, the company is the first in the country to go in for a joint cogeneration plant in collaboration with the Gujarat Alkalies and Chemicals Limited (GACL), Petrofils, IPCL and the Gujarat Electricity Board. The plant will cost Rs. 200 crores and generate 135 mw of power. GSFC will get about 40 mw. With the full commissioning of the plant, he said, the company would be practically independent of the GEB for its power needs. The company has pumped Rs. 40 crores in the company set up for the purpose, namely Gujarat Industries Power Company (GIPCO). He said this comprised 30 per cent of the equity. GEB had contributed 25 per cent and the balance is accounted for by the rest.

Mr. Swaminathan said the company had also promoted Gujarat Nylons Limited with a capacity of 6,000 tonnes of nylon filament yarn at a cost of Rs. 120 crores. He said the company had also stepped up its marketing drive and the turnover had been going up steadily. Last year, it crossed Rs. 650 crores. He said fertilisers accounted for only 70 per cent of the company's turnover. The rest is accounted for by other chemicals. He said the company had not only entered the biotechnology field but also had already started commercial production of biofertilisers. Sales in the current year were expected to be over Rs. 40 lakhs.

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Chemplast maintains dividend

Chemicals and Plastics India Ltd. (Chemplast) has maintained the equity dividend at 16 per cent on the capital enlarged by one for one bonus issue as well as the amalgamation with Metur Chemicals. As a result the outgo on the proposed dividend has risen from Rs. 87.22 lakhs to Rs. 141.97 lakhs.

Sales and other income for the year ended March 1989 rose to Rs. 114.86 crores from Rs. 53.41 crores. The gross profit also jumped to Rs. 22.25 crores from Rs. 10.70 crores. After providing interest of Rs. 734 lakhs (Rs. 482.70 lakhs), machinery lease rental charges Rs. 130.57 lakhs (Rs. 4.35 lakhs), depreciation Rs. 405.55 lakhs (Rs. 311.41 lakhs) and taxation Rs. 180 lakhs (Rs. 43 lakhs) the profit stood at Rs. 575.36 lakhs (Rs. 228.46 lakhs).

Taking into account the amount transferred from investment allowance reserve amounting to Rs. 32.60 lakhs (Rs. 15.38 lakhs), the balance profit brought in from previous year of Rs. 56.84 lakhs (Rs. 131.88 lakhs) and other adjustments, the amount available for appropriation worked out to Rs. 665.04 lakhs (Rs. 385.47 lakhs).

Of this, the amount transferred to general reserve is Rs. 44 lakhs (Rs. 23 lakhs), investment allowance Rs. 95 lakhs (Rs. 88 lakhs) and debenture redemption Rs. 129.33 lakhs (Rs. 100 lakhs). The profit carried over is Rs. 54.74 lakhs (Rs. 87.25 lakhs).

Following the amalgamation with Metur Chemicals, Chemplast has emerged as the No. 1 producer of chemicals in the south. With a broadly diversified range of products, the company's operations are organised into six divisions viz., PVC division, caustic-chlor division, solvents divisions, mattress division, water treatment chemicals division and fine chemicals division in addition to the businesses [illegible] by the subsidiaries — [illegible] and Metkem Silicon Ltd. This diversity in operations is considered insurance enough against the uncertainties of business cycles.

Production of PVC for the year was lower at 18,065 tonnes (19,159 tonnes) as the operations were suspended for a month in March, 1989 following labour unrest. There was trouble in the first few months of the current year as well. The situation became normal last June.

With satisfactory supply of alcohol and chlorine, production of EDC was maintained at required levels.

With indigenous production of PVC continuing to lag behind demand, large quantities are still being imported. Import prices have of late dipped sharply, forcing a downward realignment of domestic prices.

Referring to the Supreme Court judgement striking down the right of the State Governments with regard to control and taxation of industrial alcohol, the directors' reports say that the outlook for alcohol-based industries has thus been rendered more stable than at any time in the past few decades.

The Tamilnadu Government has cleared the company's proposal for expansion of capacity at the industrial alcohol plant at Panruti and sanctioned the necessary quota of molasses. The company proposes to install a modern plant for the enhanced capacity at a cost of about Rs. 4.5 crores.

While the installed capacity for PVC is 30,000 tonnes per annum, capacity in certain sections of the monomer plant are limiting. The company is undertaking a major expansion of the monomer section and concurrently expanding its capacity for manufacture of speciality resins. Investment in these projects is estimated at about Rs. 17 crores.

year was 36,978 tonn
with corresponding
chlorine production
from 29,979 tonne
exported 1,251 tonn

Metkem Silicon L
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offtake of products h
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placed by the Gov
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The outlook for t
fair enough. Sales an
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was Rs 5,414 lakhs a
Rs. 1,163.56 lakhs.
Rs. 396.12 lakhs for
Rs. 126.53 lakhs
Rs. 289.75 lakhs, the
was Rs. 351.16 lakh

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of three shares for eve
aggregating Rs. 1.8
company has fixed Ja
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rights entitlement. Th
open on January 15,
liest closing date is

Meanwhile, the com
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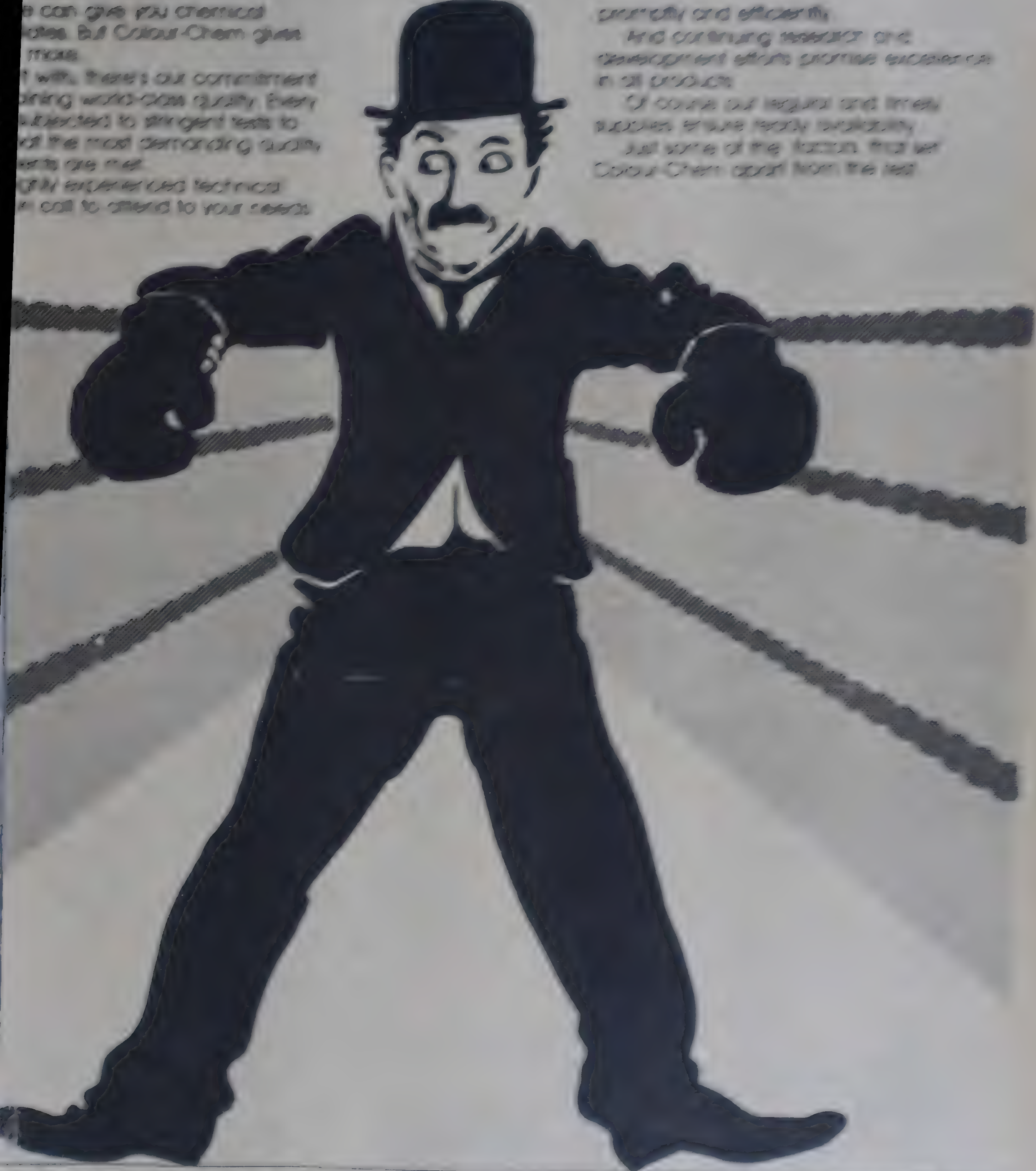

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ghlights in Chemical Technology (Part 1)

PROCESS FOR TETRA-
FURAN (THF) UNVEILED
CHEMICALS INC. (USA)

hemicals Inc. has recently
a new process for tetrahydro-
HF) as a spin-off from the pro-
maleic anhydride technology.
process of the company claims
e THF in yields above 95% via
ydrogenation of maleic anhy-
around 250°C and 40 bars pres-

ompany is also working on a
process for gamma butyrolac-
BL). The company logically
at with maleic anhydride quite
aper by its proprietary process,
sense to make derivatives such
and GBL, which are normally
d as by-products of butanediol
on. (*ECN*, 11/6/89, p. 28)

HEMICALS DEVELOPS
NE TO ACRYLONITRILE
NOLOGY

Chemicals Inc. (USA) is push-
ed with development of a route
onitrile direct from propane.
rcialization, which would sever
ndence of acrylonitrile produc-
ropylene feedstock, is expected
mid 1990s.

entional manufacture of acrylo-
s by aminooxidation of propy-
e key to the new process is in
ment of a proprietary catalyst
produces the fibre in one-step
mix of propane, ammonia and
. Dehydrogenation of the pro-
d ammoxidation of the inter-
y propylene occurs almost
neously.

new process is being tried out in
nd, Ohio, in a pilot reactor 'only
in diameter' reports B.P. Chem-
lans are a foot to build a larger
lant in Cleveland in 1990.

Interest in the new process has heightened because of hikes in propylene prices. Only recently have propylene premiums been high enough and consistent enough to justify the added process costs. (*ECN*, 11/6/89, p. 28)

A NEW PLANT AND A NEW ROUTE FOR PIVALIC ACID

The new Shell Nederland Chemie's pivalic acid plant at Pernis near Rotterdam was opened last October. It cost $72.5 million and has a capacity of 10,000 ton/year.

The Pernis plant utilizes the conventional Koch process, in which an olefin is carboxylated at high temperature and pressure using a Lewis acid liquid phase catalyst. Besides pivalic acid, the plant is also capable of manufacturing other neoacids, including 2-ethyl-2-methyl butanoic acid, 2,2, dimethylpentanoic acid and neo-decanose acid.

BASF, which currently buys its pivalic acid, has also recently patented an alternative process employing a heterogenous Zeolite-type catalyst. The W. German Company declined to give details or reveal whether it would commercialize the process. (*ECN*, 11/6/89).

A NEW FLAMELESS WASTE DISPOSAL TECHNOLOGY ON THE HORIZON

The US based engineering contractor Lummus Crest last October entered into a long-term agreement with Modar (Houston, Tex) to commercialize a new flameless waste disposal technology that could challenge high-temperature incineration.

The new Supercritical Water Oxidation (SCWO) technology pioneered by Modar holds promise in treating wide range of hazardous chemical wastes including polychlorinated biphenyls, chlorinated dibenzo-p-dioxins, di-nitro toluene and pesticides.

The two companies are already working on the design and engineering of 20,000 gals/day plant and plan future units in the 10,000-1,00,000 gals/day range. Operating costs are estimated at one-tenth those of conventional incineration.

The SCWO process makes use of the fact that water in its supercritical state (above 274°C and over 218 atm) is an excellent solvent for both organics and oxygen. By contrast inorganic salts are only spraingly soluble.

Hydrocarbon wastes treated with oxygen in supercritical water rapidly break down to carbon dioxide and water. Heteroatoms, such as halogens, phosphorus and sulfur, if present are converted to weak acids which in turn are neutralized by the addition of appropirate cations to form inorganic salts. These can be separated out and removed in the form of a concentrated brine.

In pilot plant testing destruction efficiencies as high as 99.99999 per cent are reported, depending on the concentration of organics in the waste. Because SCWO environment is flameless, the process will not require a hazardous waste incineration permit under the UD Resource Conservation & Recovery Act.

Lummus Crest sees SCWO process an an alternative solution to many current hazardous waste destruction processes, which are under environmental attack or do not inert regulatory standards in USA. (*ECN*, 10/30/89, p. 23)

IDEMITSU (JAPAN) DEVELOPS NEW CS RESIN PRODUCTS BASED ON C-5 PETROLEUM-RESIN TECHNOLOGY

Japan's Idemitsu Petrochemicals is

reported to be close to commercializing high value added products based on its C-5 petroleum resin technology.

The company has developed a technology to produce a range of transparent-grade hydrogenated petroleum resins aimed at the expanding market for hot-melt adhesives, such as those used in disposable diapers.

The company is also understood to be commercializing acrylic acid, acrylic esters and bisphenol A and building up its operations for oligomer chemicals. (*ECN*, 10/30/89, p. 24).

A WORLD'S FIRST PNEUMETIC PUMP ENTIRELY MADE OF TEFLON

The French company Asti recently unveiled a novel pneumetic pump for highly aggressive and ultra-pure fluids, which is entirely made from Du Pont's Teflon PFA fluorocarbon resin. Called the PFD-2 pump, it is made up of two sub-assemblies for the air and fluid circuits. Pumping is done by two turn PTFE bellows that move in opposition for a smooth outflow of fluid. Design options were made to rule out all dynamic gaskets and to avoid friction and the need for lubrication. The average pumping rate of one stroke/sec. permits vibration free operation. PFA resin is suitable for injection moulding and thus is cost effective for Asti as complex machined assemblies can often be replaced by single injection moulded elements. Hence the number of parts in the new pump is lower than in earlier PTFE models.

The company adds that the pump is also reliable and practically leak-free. For further information contact : Asti, Courbeooie, Paris, France.

'CHEMELEON' TEXTILES ON THE HORIZON

Fabrics that change colour with changing temperatures are tradenamed Sway UV by Toray Industries (Japan). Blue or violet patterns invisible indoors appear instantly when the fabric is exposed to sunlight and fade again in half a minute when the light is removed. The photochromic dyes causing the effect are compatible with all textiles natural or man-made and are wash-fast and light stable. When yellow and red are added to the range the company will be well on its way to a stated business objective 'chemeleon' textiles.

These photochromic dyes and their relatives were the subject of presentation by H. G. Heller at a 1988 mini-symposium in Oxford. Heller recognized their 'enormous commercial potential' and suggested their use in optical information storage applications; in lightweight plastic lenses and in security printing of banknotes, cheques and other documents. He also pointed out that the origin of 'chameleonic' materials rest on the Woodward Hoffmann rules — facile photo-stimulated conrotatory reactions coupled with sterically inhibited and slow thermal disrotatory reactions. (*Jpn. Chem. Week.*, (1989), 30(18), 1501, *Ange W. Chem. Intl. Ed. Engl.*, 1988, 27(12), 1763).

POLYETHER ETHER KETONE (PEEK) A GOOD POLYMER FOR STORAGE OF ULTRAPURE WATER

To keep ultrapure water pure, use polyether ether ketone (PEEK) tubing. This polymer will not support micro-organism growth, has fewer extractables, does not embrittle with time, is resistant to hot water and chemicals and does not crack or deform in use, according to Mitsui Toatsu. (*US. Pat.* 4784772 Nov 15, 1988, *Chemtech*, 10/1989. p. 579)

CALIFORNIA PUSHES FORWARD METHANOL APPLICATIONS IN SEVERAL DIRECTIONS

California has established a new methanol reserve to ease the state's dependence on petroleum and solve its air pollution problems.

The California 'Fuel Met Reserve', the first of its kind in will set aside nine million gels of anol that planners hope will mar establishment of a market for the tively clean-burning fuel.

The reserve is sponsored by the fornia Energy Commission, w hopes to develp methanol as a v alternative for fueling vehicles and erating electricity. The Commi wants to make the state more e self-sufficient by relying on derived from natural gas, rather th imports of foreign oil from OPE

The Commission also sees met as a partial answer to air polluti anticipates stringent EPA fuel emi standards for diesel trucks beginni 1992.

California being a trendsetter in ronmental regulations, has taken se steps to encourage methanol dev ment, including the use of 500 nol fueled vehicles in the state's fleet. The Commission's agree with Ford and General Motors cal those companies to produce 10 methanol fueled vehicles by 1992. Commission also has sponsored a gramme demonstrating the use of anol in transit and diesel truck installed recently the first retail anol gas pump in Sacramento and funded two projects run by an air ity group to generate electricity methanol. (*Chem. Eng. Prog.* 6/1 4).

MELANIN PIGMENT INCOR PORATED INTO SUNGLAS

By 1990, Bausch & Lamb (ester, NY) plans to start selling glasses developed by their resear using synthetic melanin incorp into the lenses. Consumers ho will have to pay a high price of r piece.

nin is the pigment in skin and at protects against UV-A and rays present in sunlight. chers point out that the amount nin normally present in the eyes es with age.

sunglasses are expected to appeal health conscious rich consumers ill prefer this expensive but natoad-spectrum protection from the harmful UV radiation. Bausch & licensed the technology for incorng melanin in plastic lenses from protective Technologies (San io, Tex), but is hesitant to disclose t is done. (*Chem Week*, 11/8/89 p.

HIGH-STRENGTH FIBRE CTRA) SPAWNS NOVEL ELOPMENTS IN PROTEC- CLOTHING

ectra' a new high-strength fibre oped by Allied Signal of USA was tly reported as the world's strongbre. It is about 30 to 40% stronger weight basis than Du Pont's Kevlar d fibre, with which it will probably ete most directly.

e new fibre itself has been availcommercially since 1985, but pro made from it have been under opment for the past few years.

e polyethylene plastic that Spectra de from is the same as that found li cartons, garbage bags and plasandwich bags. Ordinary polyethyis a flexible-chain macromolecule rmally crystallizes by folding, but lded portions of the polymer chain ibute little to fibre strength, and ethylene fibres made by convenl methods are therefore not very g.

owever, in the manufacturing profor the high-performance polyethe used in Spectra, the polyethylene chains crystallize in an extended, highly oriented state. This extension of the polymer chain and the orientation of chains along the fibre axis give use to Spectra's high tensile strength and high modulus (stiffness), in addition to the molecuar weight of high-performance polyethylene (1 million to 5 million daltons).

One method of producing high-performance polyethylene fibre is the solution spinning process. The high molecular weight polymer is first dissolved in a solvent, that disentangles the polymer chains, a step that is critical for attaining the extended-chain structure. The resulting gel is viscous enough to be processed on conventional melt spinning equipment. The cooled exudate from the spinnerettes forms an extended-chain polyethylene fibre that is liberated from the solvent by drying or extraction and then drawn to induce additional molecular orientation prior to final packaging.

The high cut resistance of extended chain polyethylene fibre was discovered, when scissors to cut the fibre were found to wear out very early. The mechanism is not yet well understood.

The new fibre's chemical inertness also gives it poor matrix adhesion and makes it virtually impossible to dye it (it is naturally white).

Products based on Spectra that are currently available are in the development pipeline including glove liners to protect health-care workers from exposure to infectious agents, cut resistant industrial gloves, leg chaps to protect tree cutters from chain saw accidents, bullet-resistant vests for personal protection and law enforcement and rigid ballistic armour products such as riot helmets.

The Spectra-based surgical glove liner, expected to be available shortly, is a thin, sheer, light-weight glove designed to be worn beneath a latex rubber glove. The liner provides abou 30-times the cut resistance of a late glove and about 15 times that of medium weight leather work glove. I provides protection to health worker from cuts that might introduce infectious agents including virus of hepatitis B and AIDS.

A second product an industrial glove is designed for use by Food processors (butchers or vegetable handlers etc.) and others in need of hand protection. In the case of bricklaying, stone handling or other tasks where a pair of leather gloves might be used for abrasion resistance or cut resistance, these gloves would do the same job and last a lot longer.

Another use of Spectra will be in bullet-resistant vests. Research indicates that it may give better protection than the Kevlar based vests.

Spectra fibre can also be used to make composites, in which the fibre is combined with a resin and then molded into rigid forms. Composite products being developed include military combat helmets and police riot control helmets. In the case of military helmets, the researchers at Allied Signal will endeavour to reduce the weight of the currently used aramid helmet by about 30%. (*C & EN*, 10/9/89, p. 23-24).

CARBON DIOXIDE TO REPLACE SOLVENTS IN SPRAY PAINTING

Researchers at Union Carbide (USA) have developed a process for spraying paint with carbon dioxide. The process is based on supercritical carbon dioxide. The process will replace conventional organic solvents (hydrocarbons such as alcohols, ketones, esters, glycols and chlorinated compounds) with carbon dioxide. These solvents are volatile organic compounds, which evaporate during spraying and react with nitrogen in the atmosphere, contributing to the photochemical smogs in urban areas. The pollutants also help to deplete the ozone layer.

The process called UNICARB was developed by Union Carbide in collaboration with Marc Donaline a professor of chemical engineering at Johns Hopkins University. The key to the process is that carbon dioxide enters a phase between gas and liquid called supercritical, at temperatures between 35°C and 65°C and pressures above 8 mega pascals. In this phase, it acts as a solvent.

In the conventional solvent process 1 kg. of solvent is released into the air with every 2 lits of paint sprayed. In 1988, industries in USA sprayed more than 1.6 billion lits of coatings, releasing huge quantities of the toxic compounds into the atmosphere. In conventional techniques, the paint is diluted with solvents until it is thin enough to spray.

With UNICARB, solvent is added only until it is sufficient to hold the paint — a mixture of polymer concentrate, powder pigments and other additives in solution, though not enough to thin it for spraying. Instead, supercritical carbon dioxide is added to thin the paints to a sprayable consistency just before it is piped into the spray gun. The precise amount of solvents that are necessary depends on the type of coating.

The company emphasizes that the process will not create any new carbon dioxide. The gas is a by-product of oil refining and the production of ammonia and is also available in large quantities from natural gas wells. Although the process releases CO_2 into the air, the gas will not add to the greenhouse effect because it is recycled.

Although UNICARB works with existing equipment for spraying, the company reports that it will have to change manufacturing procedures because of the elimination of such large amounts of the solvents. The sprayers will be handling materials that are much more viscous, because the new process reduces solvents by 30 to 70% and the supercritical fluid is not added until application.

Union Carbide has worked with big companies that make coatings and others that spray paint on a large scale. It hopes to establish the first industrial installation in use by the end of 1989 or early 1990. The company is now developing a machine that will work in small job shops like body shops, furniture factories etc. The coming legislation on Clean Air in advanced countries will ensure good future for the UNICARB process. (*New Sci.*, 9/23, p. 35).

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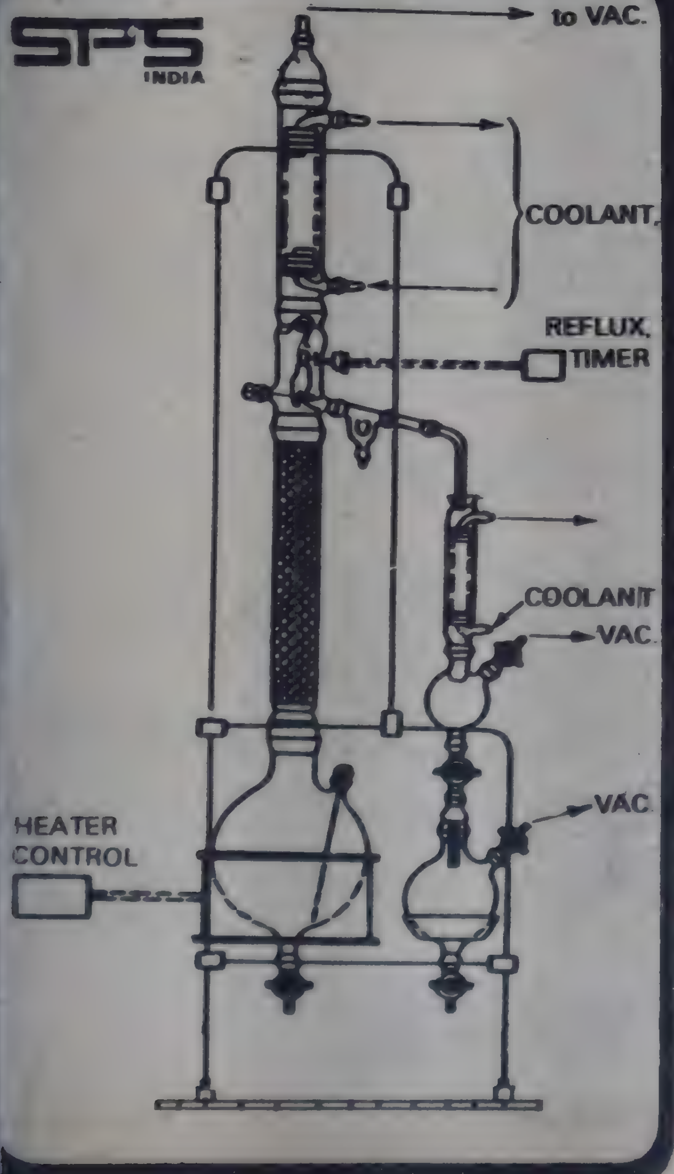

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Science Briefs

EMULSION FOR ROAD

of surfacing roads with hot
umen are numbered with the
nt of emulsified bitumen that
the way for building "cold"
faster pace.

n, used for surfacing roads, is
workable material that has to
and melted before it can be
But scientists at the IDL-Nitro
ic Research Institute (INBRI)
lore have produced bitumen
that remains in liquid form
spraying without any heating.

dvent of bitumen emulsion
can an end to roadside heating
en barrels, waste of fuel, and
smoke and pollution that are
nmon at sites of road repair.

important, according to Dr. V.
INBRI's chief executive, is that
rk can be done faster since no
is involved. Handling of the
und bitumen poses no hazards
kers and requires no heavy
ry, said Dr. Vedam.

major advantage is that bitumen
n can be sprayed on wet aggre-
ven after a rain. Endowed with
pping properties the emulsion
s the aggregates from stripping
r a heavy rain.

se the emulsion remains in
m right up to zero degrees Cel-
an be used for road work in cold
According to Dr. Vedam, the
Roads Organisation has
d to emulsified bitumen and one
unk roads connecting Bangalore
n be paved with the emulsion.

ng better penetration than bitu-
e emulsion is suited for spray
ions like surface dressing an
lling, it is claimed. The cost of
bitumen emulsion is higher than bitumen, but the total cost of road work is claimed to be lower because of savings on fuel, absence of handling loss and reduction in labour for heating.

Besides, the drums containing the emulsified bitumen can be re used unlike the bitumen barrels that have to be thrown away. Another innovation by INBRI scientists is a ready-to-use premix made with a speciality binder and aggregates for instant filling of cuts and pot-holes on road surfaces. It is claimed to be ideally suited for maintenance of internal roads in housing colonies and for prompt repair of cuts made on roads by telephone, electricity or sewerage workers.

FLYASH REDUCES HEAVY METAL TOXICITY IN SOIL

There may be yet another use of the large amounts of flyash that are spewed out by thermal power stations -- reducing heavy metal toxicity in soils. According to preliminary indications of studies conducted by soil scientists at the Indian Agriculture Research Institute (IARI), New Delhi, alkaline flyash may reduce heavy metal toxicity in soils by making ions of these metals unavailable to plants.

Amongst the major heavy metal pollutants in soils are lead, cadmium, iron and manganese. Large amounts of lead compounds are emitted by automobiles and cadmium is released by zinc-smelting industries.

While heavy metal pollution of indian soils is not alarming at present, the cumulative effects over a longer period may be more dangerous, Dr. R. K. Rattan, senior scientist at the division of soil science and agriculture chemistry at IARI, said.

One significant finding of the IARI team is that it is the alkaline flyash that reduces the availability of heavy metal ions to plants. This was indicated in studies where flyash from the Badarpur power station near New Delhi, which had a pH of 7.3, did not alter heavy metal toxicity, but flyash from the Ramagundam power plant in Andhra Pradesh, with a pH of 11, did.

Flyash essentially contains ferro alumino silicates. Alkaline flyash also contains free sodium and potassium oxides. When these free oxides come in contact with the water present in the spaces between soil particles, they form hydroxides immediately.

The hydroxyl ions present in these hydroxides help to neutralise the hydrogen ions present in soils rendered acidic due to the presence of heavy metal ions, Dr. Rattan explained. So, it might be more inexpensive if alkaline flyash could be used instead of the conventional lime to treat acidic soils, Dr. M. B. Kamat, head of the division, said.

Dr. Kamat however cautioned that the experiments were conducted at a laboratory level in pots so far, and field trials have not been conducted to verify the results on a large scale.

FRUIT AND VEGETABLE WASTES – YIELD BIOGAS AND MANURE

An ordinary tomato can not only be squeezed and mashed to make jam, pickle and sauce, but further exploited to yield energy and still hold some use as a soil enricher.

Researchers at the Indian Agriculture Research Institute (IARI), New Delhi, say fruit and vegetable wastes can be used to yield biogas, and the biogas slurry in turn can be used to enrich the soil.

Hundreds of tons of such wastes are generated daily in fruit and vegetable processing industries involved in making jams, pickles and sauces. Disposal of these wastes, which amount to 10 to 50 per cent of the raw material input, creates economic and environmental problems. Although some of them can be used as cattle feed, many rot within a short period of time and are unfit for consumption by cattle. Generally, they are dumped as landfill, which may lead to land, water and air pollution.

Recently, however, scientists at the division of soil science and agriculture chemistry in IARI have found these wastes to be a potential source of biogas. A team carried out anaerobic digestion of wastes of apple, pears, banana (skin and stem) and Indian squash ('tinda' in Hindi), with and without cowdung, at around 34 degrees Celsius and near neutral pH (between 6.5 to 7.5). Acidic wastes were pretreated with 0.3 per cent sodium hydroxide solution before digestion.

The team found that the fruit and vegetable wastes by themselves generated only small amounts of biogas. While banana skin and Indian squash yielded only about a quarter of the biogas generated by cattle dung which was used as a control, banana stem gave about 60 per cent, Dr. M. C. Jain, senior scientist at the division said.

Compared to 180 to 200 litres of biogas generated per kg of dry matter in the case of cattle dung, apple wastes gave 100.5 litres, banana skin 50.6 litres and banana stem 143.9 litres.

But supplementation with cowdung improved yields by as much as 34 to 77 per cent, Dr. Jain said. The total gas yields from mixtures of cowdung (added in 1:1 or 1:3 proportion) and various fruit and vegetable wastes ranged between 183.2 and 253.5 litres per kg of dry matter, with the methane content varying between 56 and 64 per cent, he added.

Another interesting finding of the IARI team is that the biogas slurry can be used to enrich soil. Ongoing studies at the division show that the spent slurry can replace upto 40 per cent of the urea requirement in a field.

The digested slurry coming out of the biogas plant has been found to be superior to farm yard manure as far as nutrients and capacity to improve the physical properties of soil are concerned.

Experiments conducted in plots of size 2m x 2m show that sun-dried slurry gives better results than wet slurry.

The IARI team also conducted field trials in 7m x 7m plots in the institute and found that production of wheat and maize crops increased after applying the sun-dried spent slurry to the soil. "Wheat production in fact improved by as much as 58.8 per cent," Dr. Jain said.

But, he cautioned, the slurry can replace only upto 40 per cent of the urea requirement in a field. Both wheat grain and straw yields decline with slurry substitution beyond 40 per cent.

In plots receiving about 80 per cent of nitrogen through slurry, the potassium availability improved, as did the status of micronutrients like zinc, copper, manganese and iron.

OPEN WIDTH VACUUM HYDRO EXTRACTION FOR TEXTILES

Textile engineers in Maharashtra have invented a device for the removal of process liquor from wet fabric, which is not only highly efficient but also saves 40 to 50 per cent thermal energy.

The open-width vacuum hydro extracter has fetched Dr. N.S. Mehta and Dr. M.M. Chandekar of the Primatax Machinery Limited, Thane, a National Research Development Corporation award of Rs. 25,000. They reported the details of the unit in the journal "Invention Intelligence".

Generally, during the processin simple woven fabric to a marketable ished fabric, it is passed through a se of chemical solutions and finis agents. After each such treatment, fabric has to be dried to make it s able for the next treatment, wh requires a large amount of ther energy.

There are two types of mois present in a fabric during wet proc sing. One is the bound moisture wh is attached to the fabric by hydrog bonding and which can be remo only through thermal energy. The o is the unbound moisture which mechanically entrained in the fabric to surface tension and is present wi the interspaces. It can be removed us mechanical energy -- squeezing vacuum extraction.

The proportion of bound unbound moisture varies with the fa quality, its blend and weaving pa The amount of unbound moisture wh can be removed mechanically is high. Since the thermal removal of bound moisture is costly, textile te nologists endeavour to remove the m imum unbound moisture.

Moisture removal by a vacu hydroextractor is achieved by pass the wet fabric in open width condi over a fine slit provided on a vacu chamber which is being continuou evacuated with a vacuum pu Because of differential pressure either side of the fabric caused by vacuum underneath the chamber, a sucked through the fabric and the underneath a very high velocity an carries the moisture with it. The amo of moisture removed depends on permeability of the fabric and suc capacity of the vacuum pump.

The Thane scientists have impro upon this basic concept. The moistu air mixture drawn in a vacuum cham is separated in a separator where mixture is collected at the bottom is sucked off by the vacuum unit is also provided with an iquid recovery system where collected at the bottom of the s automatically drained out to here so that expensive chem- in the process are available

enings for a cloth of a parti- dth remain partly uncovered ocessing fabrics of smaller his results in drawing of max- from the uncovered slit por- o absence of resistance. To get results, it is therefore neces- over the unused portion. The is provided with an automatic ng device which senses the ges and repositions the sealing over the unused portion of the

CROPS: ENERGY PLANTS E FUTURE

crops, plants that yield m-like hydrocarbons naturally, uce the country's energy bills ture and take the pressure off m in a number of industries.

plants, also called hydrocarbon r energy plants, contain a of chemical constituents which bstitute for petroleum and um-based products. These rbons are chemically more than the normal hydrocarbons other plants, and can therefore, directly unlike the carbohy- which have to be either micro- ally degraded or thermochemi- nverted before use.

Department of Non- tional Energy Sources (DNES), lhi, in collaboration with some ities and research institutes, has ed about 355 species of such l energy plants. Most of them o five or six families in the plant – Euphorbiaceae, Apocyana- sclepiadaceae, Urticaceae, Convolvulaceae and Sapotaceae. These latex-bearing groups grow extensively in India, particularly in the arid zones and wastelands, Dr. H.L. Sharma from DNES said.

Extensive surveys in Andhra Pradesh have shown that petrocrops are abundantly available in Ranga Reddy, Nalgonda, Visakhapatnam, Srikakulam, Anantapur, Chittoor, Kurnool, Krishna and Guntur districts. Similarly a number of latex-yielding plants are seen in Alwar, Ranthambore, Jodhpur and Udaipur in Rajasthan; at Rohtak, Hissar, Surjpur and Kalka in Haryana; and at Bardoli, Bharuch, Ahmedabad and Pavagarh in Gujarat.

The plants grow under extreme conditions -- in infertile and degraded soils that have no surface layer, no nutrients and no organic matter. Not only do they thrive in such habitats that are unfit for agriculture, but they also support the growth of some grasses, thus offering an additional advantage of greening the land.

One such extremely promising plant is jojoba which yields an oil that resembles sperm whale oil and is a source of liquid wax. A native of the Sonaran desert of California and Arizona in the United States and Mexico, the plant has grown successfully under extreme saline conditions in India. It was introduced for the first time about two years ago in the coastal sandy soils and sandy loam soils in Visakhapatnam in Andhra Pradesh with 15,000 ppm of salt. It could also tolerate salinity levels upto 30,000 ppm, albeit with reduced yield. Scientists at the Central Salt and Marine Chemicals Research Institute, Bhavnagar, are evaluating the yield performance of 65 selected strains of jojaba, Dr. Sharma said.

One of the most significant findings in this context is the recent finding of the Indian Institute of Petroleum (IIP), Dehra Dun, that sulphurised jojoba oil is very much similar to petroleum.

The DNES projects encompass three basic parameters -- production and improvement of high-yielding hydrocarbon plants, conversion of these natural hydrocarbons to petroleum-like compounds and utilisation of these compounds. Keeping in view the importance of mineral nutrients in increasing the productivity of plants, the Department of Botany, Lucknow University, studied the effects of zinc, copper and manganese on two petrocrops, Euphorbia antisyphilitica and Calotropis procera.

The experiments revealed that addition of the three micronutrients increased the growth, biomass and the epicuticular wax yield of these plants. Zinc treatment, in particular, increased the wax concentration in Calotropis leaves.

The Department of Botany, Rajasthan University, also sponsored a project to develop agro-technology for selected petrocrops. Scientists found in their studies that treatment of cut twigs with cyocoel (CCC) and indole acetic acid (IAA) promoted maximum growth in the cuttings of Pedilenthus tithymaloides and Jatropha curcus. Spraying the plants with gibberellic acid favoured fruit setting and increased seed yield 2-3 folds, while application of 40 per cent farm yard manure led to maximum growth in these plants.

The latex samples vary at different times of the day and in different seasons. Latex collected in the morning contains more moisture, while is is more dense during August and September. It contains considerable amounts of carbohydrates, proteins, amino acids, ascorbic acid, alkaloids and phenolic compounds besides the hydrocarbons. The ether-extractable portion from the dry material has a better combustion value and scientists do not rule out the possibility of using some of these compounds either in liquid or in crystalline form as a source of fuel. Latex from Euphorbia species has potential to sub-

[illegible] petro products. Studies at the Shri ram Institute for Industrial Research at New Delhi have shown that the latex can be used for making water-thinnable emulsion paint which is a petroleum-based product.

The latex can also be used for making composites with jute fibre or jute cloth. It can be moulded into sheets to serve as roofing material for huts and partitions in offices which at present use synthetic resins for making the composites.

Another significant finding relates to the use of non-edible vegetable oil as diesel fuel. Investigations by the Department of of Mechanical Engineering, IIT, Madras, show that blends of vegetable oils and diesel can serve as efficient fuels. Pure vegetable oils can be used in diesel engines only under emergency conditions when diesel is not available at all. This is due to the high smoke forming tendency of the vegetable oils. But 20 per cent blends are equal to diesel both in terms of efficiency and emissions. Equal blends of methyl esters of vegetable oils and diesel oils can also be used to extend diesel oil supplies. The studies have also confirmed that with minor modifications in the existing engines of vehicles some of these oils can reduce petrol consumption.

Cassava is emerging as another potential source of alcohol. A project sponsored by the Regional Research Laboratory, Trivandrum, undertook three major tasks: production of starch hydrolysing enzymes, hydrolysis of starch and conversion of starch hydrolysate into ethanol. The laboratory created a special solid-state fermentation facility (SSFF) to prepare the enzyme and optimise the process conditions. Experiments with 40-50 kg cassava flour in a 250 litre reactor are in progress.

Studies at the Central Salt and Marine Chemicals Research Institute, Bhavnagar, have shown that alginate wastes can also generate biogas during anaerobic digestion. More than 20,000 tonnes of alginate wastes are generated in India. They contain about 5-7 per cent dry matter which contains 72-73 per cent volatile matter and 27-28 per cent non-volatile matter. Experiments carried out for production of biogas using an anaerobic batch type digester recorded 1.5 to 2.0 litres of gas per kilogram of dry waste per day.

– P.T.I. Science Service,
Dec. 16-31 1989 (All above items)

INDIA MAKES STRIDES IN PLANT BIOTECHNOLOGY

Plant biotechnology is fast becoming an important area of agricultural research in India with greater focus on genetic engineering and tissue culture, says Dr. V.L. Chopra, head of the Biotechnology Centre at the Indian Agricultural Research Institute in New Delhi.

Genetic engineering includes fusions, deletions, inversions and transpositions of genes, but the most important of these is hybridisation of genes — grafting a piece of the DNA from one organism to the DNA of another.

Research in this technique, called recombinant DNA, got a boost after the discovery of plasmids and some other enzymes.

Whereas tissue culture technology has been practised at IARI for 40 odd years, DNA-based biotechnology is new the world over.

"However, India, just four years into the field, has achievements comparable to many in the developed world and in some cases like rapeseed research has a definite advantage," Dr. Chopra said.

Similarly, India is well ahead of many countries in creation, utilisation and evaluation of clone variation, he said.

But as technology becomes more and more sophisticated, the job of plant breeder becomes complicated. He has
to pay attention to
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"Therefore, it be
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Dr. Chopra said.

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cal microscopes and much better contrast compared to electron microscopes. The scales which these X-ray microscopes allow to be examined in detail are of the order of fractions of a micrometre. A micrometre is a millionth of a metre and cells are usually of micrometre thickness while viruses have dimensions of 0.5 micrometre. Such resolutions can help understand how viral structures evolve, the growth of cancer cells, the action of cells in the immune system, etc., Dr Suckewer said.

Resolving Power: The resolving power of a microscope is proportional to the wavelength of radiation the instrument uses to see the object; that is, the instrument can distinguish features which are of a few times the wavelength used. The X-ray microscopes use the so-called soft X-rays, with wavelengths of a few nanometres (a nanometre is a billionth of a metre). The visible radiation that optical microscopes make use of, on the other hand, have wavelengths in the region of 1,000 to 10,000 nm.

Electron beams that electron microscopes employ have wavelengths that depend on the energy of the beam and usually these microscopes do have resolving powder that is similar to the X-ray microscopes but, for biological applications, the resolving power is effectively far less due to the poor contrast in the image. This is because the variation of electron densities across the material viewed is not significant and beam-material scattering effects dominate and obliterate contrasts. By using X-rays this problem is avoided, Dr. Suckewer said. The Princeton plasma group had developed X-ray lasers nearly five years ago with a wavelength of 18.2 nm and subsequently lasers of shorter wavelengths 15.4 nm and 12.9 nm – have been developed. The power of lasers used in X-ray contact microscopes is a few millijoules; these X-ray lasers are applicable to lithography in microelectronic chip making etc., according to Dr. Suckewer. X-ray lithography is an important tool in the fabrication of Very Large Scale Integrated Circuits (VLSI).

Imaging microscope: A more advanced microscope which Dr. Suckewer's team has recently developed is the so-called imaging microscope, as opposed to the contact microscope, which makes use of X-ray optics and magnifies images just like optical magnification and records the images. The imaging microscope has now been patented by Princeton University. A multi-layer mirror system is used to amplify the X-ray images of the object viewed from tenths of a micrometre to about three micrometres. Once amplified to this level the image becomes amenable to be recorded on imaging cameras that use the so-called Charge Couple Device (CCD) arrays which are about 100 million times more sensitive than photocells.

The X-ray lasers in imaging microscopes have power about a thousand times less and the laser radiation is delivered in short bursts or pulses and images taken in that time. The thrust of ongoing research, according to Dr. Suckewer, is to develop a compact imaging microscope in which the whole equipment is small enough to look cells in vivo or look for organisms in water also. Dr. Suckewer, a scientist of Polish origin and educated in Moscow, is now engaged in developing subpicosecond X-ray lasers of even shorter wavelength of 1 nm using the new generation krypton-fluoride laser systems. These have enormous power and laser radiation is delivered in pulses of extremely short duration of 300 millionth of a billionth of second (femtosecond). In this short duration light travels over distances of only a hundred micrometre – the thickness of a hair. Such pulses of light create very high electromagnetic fields of 100 giga Volt per cm. A field of this magnitude can pull apart atoms and [illegible] – a phenomenon called [illegible].

TUNGSTEN FILM WITH A THICKNESS LESS THAN 1MM

Nisshin Steel Co. Ltd., in Japan has developed a tungsten film having a thickness of less than 1mm, reports "Techno Japan". The melting point of tungsten is 3200 degrees to 3300 degrees Centigrade which is higher than molybdenum or ceramics. Therefore it is used as structural material of electronic parts requiring thermal resistance in the form of a sheet, rod or wire.

The company has already commercialised a superfine pipe having a diameter of 2mm or smaller using tungsten. By the development of the film, a new application to thermally resistant heaters to be used at a high temperature will be possible. However, tungsten is resistant to heat but not to oxygen. Therefore it is usable at a temperature of 2500 degrees Centigrade in vacuum but not in oxygen. In order to protect it from oxygen, measures such as coating the surface is required. In the future, the company is going to study mainly non-organic ceramics as a coating material. No heat resistant heater which is operable at a temperature of 2000 degrees Centigrade in an oxygen atmosphere has been developed, and the commercialisation is awaited.

-- P.T.I. Science Service,
December 16-31, 1989

HIGH-PERFORMANCE BUTTON LITHIUM BATTERY

Sanyo Electric Co. Ltd. in Japan has developed a high-performance lithium button battery with life longer by 7 to 30 times than that of conventional lithium batteries with a single charge. The conventional lithium battery uses carbon or conductive polymer, while the new battery employs the new synthetic manganese dioxide containing lithium.

The manganese metal is used for the negative pole as in the conventional product. Sanyo Electric expects that the new battery will be in demand for power supplies for memory backup and portable electronic devices such as electronic pocketbooks. The battery has an operating voltage double or more than the nickel cadmium button battery and has less performance degradation during long storage.

-- P.T.I. Science Service,
December 16-31, 1989

NEW CAMPTOTHECIN ANALOGUES MAY AID IN COLON CANCER

Synthetic analogues of the drug camptothecin may be effective chemotherapeutic agents against cancer of the colon, according to a recent report by researchers in the United States. The finding may help improve chemotherapy for patients with locally advanced or metastatic colon cancers in whom prognosis is generally poor because of the marginally effective chemotherapy currently in use.

The new drug is a synthetic analogue of camptothecin — a plant alkaloid from Camptotheca acuminata. The original alkaloid is a water soluble sodium salt, and initial trials with it led to partial remission in patients with advanced gastrointestinal cancer. However doctors reported leukopenia (reduction in leucocyte count to levels below the normal count) as a dose-limiting toxic effect. The most prominent non-haemotological complication noticed was haemorrhagic cystisis. The lack of more effective compounds with fewer side effects hampered further development of camptothecin for clinical treatment of colon cancer.

Recently, however, a team of scientists in the United States, led by Dr. Bepinno C. Giovanella, from the Stehlin Foundation for Cancer Research, St. Joseph Hospital, Houston, has reported that new synthetic analogues of camptothecin may be effective against colon cancer. The finding followed renewed interest in the drug after scientists ide tified a nuclear enzyme DNA topoi merase 1 as the principal target of can tothecin. The enzyme plays an imp tant role in DNA replication and ot cellular functions.

Human topoisomerase 1 is a mono meric protein of 100 kilo daltons an acts by relaxing supercoiled DN report Giovanella and co-workers.

Camptothecin interferes with t DNA breakage-reunion reaction ca lysed by topoisomerase 1 by trapping key covalent enzyme -DNA interme iate, the report says. Topoisomerase levels are considerably lower in norm cells than in cancerous human col cells. In general, the levels are 14- fold higher in the cancer cells, the s entists say.

On grafting human colon tumou into immunodeficient mice, the tumou disappeared completely when trea with camptothecin analogues and ne ative side effects from the drug we minimal. In their experiments, path ogists froze tissues of colon tumours an normal mucosa in liquid nitrogen with an hour after surgery and stored the at -80 degrees Celsius for further an lysis.

Fifty grams of the finely min tissue was injected under the skin in th chest region of mice and after a wee synthetic analogues of camptothe were injected. Controls were trea with sodium chloride used as a solv for the compound.

Of the various analogues, 9- induced disease-free remissions and overal drug toxicity was reported to low. Its high efficacy, however, is completely understood and further dies on camptothecin analogues necessary to evaluate their clinical u fulness, the scientist say.

-- P.T.I. Science Ser
December 16-31, 1

New Products

O BALL VALVES

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TROGEN GAS GENERA-

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nitrogen plants in capacities ranging from 5 NM^3/hr to 1500 NM^3/hr and suitable for generating gas of purity ranging from 98 per cent to 2 ppm (ultrapure nitrogen).

PSA nitrogen plants are based on the well proven technology of separation of nitrogen from compressed air by absorption of oxygen from compressed air over carbon molecular sieves (CMS).

The advantage of PSA technology lies in the fact that is neither cryogenic nor does it use scarce petroleum fuels. Low cost of nitrogen generation of less than Rs. 2 per NM3 makes PSA technology economical as against cylinder nitrogen even for small capacities.

Other advantages are fully automatic start up, skid mounted packaged unit, virtually negligible maintenance with the only utilities required being compressed air and cooling water.

For details contact: Indcon Projects & Equipment Pvt. LTd., 344, New Nagpada, Hirji Govindji Estate, Opp. Richardson & Cruddas Ltd., Bombay 400 008.

OXYGEN CONVERTER

Oxygen converter introduced by Jenway Ltd., UK., can convert any conventional pH or conductivity meter with an mV range to give a direct readout of dissolved oxygen in either p.p.m. of %. It may be used with any high impedence digital volt-meter, chart recorder or data logger. Jenway also manufactures dissolved oxygen meters for laboratory and field use.

Model 9010 embodies the state-of-the art electronics. It converts the output from the highly stable DO2 probe into a millivolt output and covers the range of 0 to 19.9 ppm and 0 to 200%. It is connected to the instrument via a one-metre lead which is fitted with a BNC connector. Alternative connectors are available.

The unit is supplied complete with a dissolved oxygen electrode which is an exclusive product of Jenway's electrosensor division and is one of the most stable DO2 probes in existence, incorporating dual temperature compensators for membrane permeability and oxygen solubility and having pre-tensioned screw on membranes to ensure instant replacement and repeatability of readings.

The instrument is supplied in a protective case complete with two membranes, a bottle of electrolyte, a zero solution and three BOD rings for varying sizes of bottles.

For further details write to Aman Marketing Services (P) Ltd., 101, Mittal Chambers, 228, Nariman Point, Bombay 400 021.

LIQUID LEVEL CONTROLLER

Innosys automatic liquid level controller controls liquid levels in a simple, inexpensive yet effective manner. It automatically regulates the operation of motor pumps according to the fluid level in overhead tanks, thus preventing wastage and avoiding errors through human labour.

It consumes negligible current, requires no maintenance, is shock-proof and very economically priced. It is a must for multi-storey buildings, hotels, industries and generally wherever overhead tanks are required.

Soon, a lower-cum-overhead tank model will also be introduced in the market, which will safeguard against dry running of pumpsets where underground liquid supply is scarce. It is also suitable for pumping stations as well as farms. For further details contact Innosys Electronics & Systems Pvt. Ltd.,

174/A-2, Shah and Nahar Industrial
Estate, Dhanraj Mills Compound,
Lower Parel (W), Bombay 400 013.

NEW CARBON BLACK/PLASTIC CONCENTRATE

The series of Degussa's carbon black/plastic concentrates has been extended by the introduction of RKK UNI 40. This new product is suitable for use as a black pigment in thermoplastics and differs from Colcolor UNI 50, which has been on sale for this purpose for a number of years now, in that it consists of a larger particle-size and therefore is a cheaper pigment black and a modified binding agent. As the pigment accounts for a high proportion of the productr, RKK UNI 40 exhibits good spreading properties. The polymer binding agent does not contain any filler, the carbon black is dispersed to an ideal degree. This new product can be handled cleanly, while batching presents no problems.

"DEGULOG" SENSOR SYSTEM

The degulog sensor system, from the Measurement and Control Products Business Area (Federal Republic of Germany) represents a new generation of field transducers. The degulog system combines analog transmitter technology with the versatility of a microcomputer, thereby widening the applications of Degussa's range of analog head and field transducers for temperature measurement, which enjoys a high reputation in measuring and control technology.

The degulog field transmitters are equipped with microcomputers which process the digitized signals. The degulog system is of particular benefit wherever and "intelligent" evaluation of results is desired. Such applications include plausibility tests, linearization of input signals, trend calculations, etc.

Degussa AG has acquired VDO Messund Regeltechnik GmbH from
Adolf Schindling AG of Fr
Degussa will combine this co
with its own Measurement and
Products Business Area to form
company called SENSYCON
for the production of industrial
and process control instruments
tems. The new company will b
in Hanover, West Germany.

The fusion of the two areas
ity to form SENSYCON Gmb
first step toward a major expa
business activities in the rapidl
ing sensors market. Worldwide
this market are already estima
billion deutsche marks. The c
will concentrate its activities
the field of industrial measure
control technology. With a staff
1,100 in the two locations of
and Hanau, and additional dom
foreign subsidiaries, SENSYC
achieve annual sales in excess o
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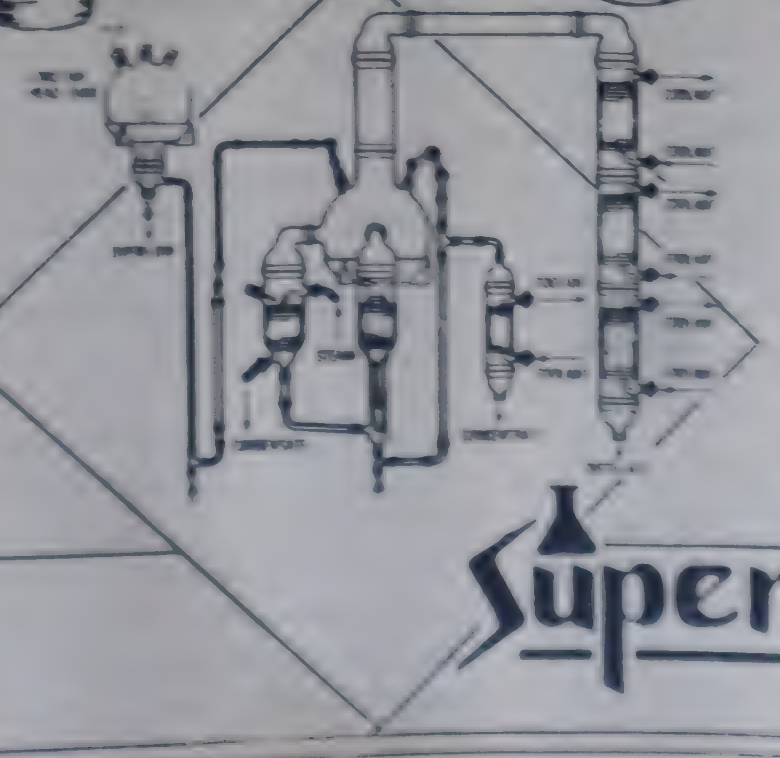

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TRADE INQUIRIES ARE SOLICITED

Environmental pollution problems of sugar and distillery units in Maharashtra

Dr. D.G. HAPSE, S.V. ARABATTI and P.L. KULKARNI
Vasantdada Sugar Institute, Manjari (BK), Pune.

About the Authors

Dr. D.G. Hapse is specialist in plant physiology, agronomy, plant breeding and cyto-genetics and Director, Deccan Sugar Institute, Pune. He holds post-graduate degrees — M.Sc. (Agriculture) from Pune Univeristy and Ph.D. from Penn. State University/IARI under USAID program. Earlier, he has held faculty positions at College of Agriculture, Pune and Dhule and DSI. He was also with Central Sugarcane Research Station, Padegaon as Sugarcane specialist to improve cane yield and sugar recovery. He is an adviser to several sugar factories and a member of several state and central institutions/committees/panels for sugar industry. He has a number of publications in national and international journals and is actively associated with several professional and social welfare programs and has travelled widely.

S.V. Arabatti has over three decades of wide experience in major distilleries in Maharashtra. His expertise covers many aspects of alcohol production — alternate raw materials, batch/continuous fermentation, absolute alcohol, IMFL, spent-wash incineration and potash/energy recovery besides by-products. His rich experience is now available to many distilleries subsequent to his joining Deccan Sugar Institute, Pune in 1985, as alcohol technologist.

P.L. Kulkarni is a Chemical Engineer with B.Tech., M.Tech., degrees from Mysore University. He is engaged in sugar technology and By-products and chemical engineering applications like ion exchange, evaporation, combustion at Deccan Sugar Institute, Pune since 1975.

t

are over 100 sugar factories and 40 distilleries in atra State, producing about 3.0 million tonnes of d 160 million litres of alcohol annually. Quantity of produced from sugar factory amounts to 0.5 to 0.6 quintal sugar produced, whereas 15 to 20 litres of sh is produced per litre of alcohol. The present pro- pted in sugar factories for the treatment of effluent ssed along with the steps suggested for reduction in of effluent by proper house-keeping. Distilleries conventional batch-fermentation technique are still g anaerobic lagooning method whereas distilleries g continuous fermentation give concentrated spent- -25% solids) advantageous for the process of con- on and incineration and also for composting. This eviews the current status and performance of various ogies adopted.

industry

sugar industry in India has been playing an important the economic development of the country. There are 0 sugar mills in India producing sugar to the extent illion tonnes of which Maharashtra's contribution is nearly 30%. The various steps in manufacture of sugar from sugarcane are crushing and extraction of juice, purification, concentration, crystallisation, centrifugal separation of crystal sugar, drying and bagging.

Thus it may be seen that the process of sugar manufacture does not in itself have any operation necessitating regular discharge of liquid effluents. The discharge often seen in practice comprises of washings and surplus generated in the vapour condensing systems. The average quantity of effluent discharged from sugar factory amounts to 500-700 m^3 per day for 1250 TCD sugar factory with the following typical analysis:

pH: 4.5 to 6.0
BOD: 1000 to 1500 mg/l
COD: 1800 to 2500 mg/l
SS: 100 to 150 mg/l
Oil and grease: 50 to 80 mg/l

The basic principles for the treatment of sugar factory effluent are based on those already well standardised for domestic sewage, such as coarse and fine screening to remove suspended solids, sedimentation for removing settleable constituents, separation of oil and grease and anaerobic digestion, followed by aerobic treatment or dilution and use as irrigation water.

All the sugar factories in Maharashtra are following one of the following methods for the treatment of effluent: Lagoons, conventional treatment or extended aeration. Based on the study carried out by Vasantdada Sugar Institute and other research institutes and reputed consulting agencies, the following common observations are made regarding the operation/performance of effluent treatment plants for sugar factories.

1. Some of the factories are over-utilising the crushing capacity which increases the load on effluent treatment plant above design capacity.
2. Frequent failure of power supply from electricity board also affects the performance.
3. Sludge bulking has been reported in some cases.
4. Lack of qualified and trained personnel for operation and maintenance of plant and carrying out regular routine analysis. However in some cases where sugar industry is linked with ancillary industries like distillery, paper and chemical plants, qualified/skilled persons are appointed for the operation and maintenance of effluent treatment plants.
5. Lack of proper housekeeping and cleanliness inside the sugar factory which leads to increase in pollution load.
6. By adopting proper recycling and reuse of waste water, the quantity of raw water used has been drastically reduced which leads to reduction in pollution load in respect of quality and quantity.

In general, it has been observed that the main pollutants in the effluents from sugar factory are oil-greases and sugar bearing products from floor and press washing etc. Through good housekeeping and separation of the streams from mill house, boiler house, press mud section and boiling house, and through ordinary preliminary treatments like oil grease trapping, separation of solids by sedimentation, mak up pH through addition of lime, separating and recycling high sugar bearing streams, it is possible to maintain the p lution load within tolerance limits prescribed.

Distillery industry

There are 40 distilleries in Maharashtra having a t licensed capacity of 220 million litres/annum. The ave alcohol production in Maharashtra distilleries is abou million litres per annum. The principal raw material for d tilleries is molasses which is a by-product of sugar factor The annual production of molasses in the state of Mahar tra is 8.0 lakh tonnes which on an average is 3.5% of t cane crushed. The average yield of alcohol per tonne molasses ranges from 220 to 235 litres/tonne. Average sp wash generated is in the proportion of 15 litres per litre alcohol produced in case of conventional distilleries. Rece seven distilleries have adopted the latest technology of c tinuous fermentation and concentration of spentwash. quantity of spentwash generated in these distilleries va from 5-10 litres per litre of alcohol produced.

The spentwash which is a waste product of the distil is capable of polluting underground water, streams, and ri water. It is highly acidic and carries a BOD load 35000-45000 ppm. The total solid contents in spentwa found to be as given in Table 1 for batch and continuous p cess.

The capacity of distilleries range from 15,000-75,000 L with spentwash discharge of 225 to 1125 m^3/day. If spentwash is not treated properly and is allowed to flow fields or rivers very serious nature of pollution can take pl Although spentwash itself is not highly toxic it is very m favourable for the propagation of toxic bacteria, endang

Table 1

Sr. No.	Process	% Solids	Special Features
1.	Conventional	8-10	Alcohol %: 6-7%. Recovery of steam from spentwash Use of Exhaust steam for R. column bottoms
2.	Cascade System	16-22	a. High alcohol conc. of 9-10% b. Use of Reboiler and flash evaporation system c. Use of exhaust steam d. Yeast recycling
3.	Biostil	22-25	a. Spentwash recirculated for dilution of molasses b. Dilution water used is only 30% of conventional syste c. Use of Reboiler d. Use of exhaust steam for rectifying column bottom

h of cattle and human beings, who have to depend uted water. Due to high concentration of BOD sh aquatic life is highly affected.

eration

ring the potential danger due to pollution of water ustrial waste, Government has enacted stringent ipulated the following rigid specification for the treated spentwash.

	BOD (mg/l)
ation on land	100
harge in river	30

y difficult for the distillery to treat spent wash to requirement of above specification because of f proper technology. In Maharashtra most of the s are still adopting lagoon system for spentwash.

eral method for treatment of spentwash was that bic digestion in open lagoons. It consists of 3.5 M on with 60 days detention capacity. The culture for digestion was developed by dilution of cow dung enance of pH at 7.0 by addition of lime. Once the anaerobic digestion is well established the pH of s automatically maintained at 7.0. The BOD is to 80 to 85% of the total. The disadvantages of e percolation of spentwash and pollution of ground odour nuisance. The effluents of lagoon still have D (6000-8000 mg/l). Permission for this kind of is now practically discontinued. In the process of , valuable methane gas is lost to atmosphere.

ash of distillery is looked upon as a source of energy f its high calorific value. Two principal methods ble for energy generation from spent wash.

bic digestion and recovery of methane gas.
ntration and incineration of spentwash.

nt technologies of anaerobic digestion of spent- methane gas generation are now available. BOD spentwash is reduced by 35 to 90%. The digester as a BOD of 5000 mg/l. It can be used for com- ne distillery in Ahmednagar District has installed lged plant for methane gas generation based on hnology. The results reported are very attractive recovery of energy from spentwash. There is sub- ving of fuel for steam generation.

distillery (45,000 LPD) which has finalised Paque hnology to treat its spentwash for methane gas is hmednagar District.

ical results expected by the installation of methane gas plant are as under.

Distillery capacity 45,000 LPD

Quantity of effluent	700 m^3/day
BOD reduction	85-80%
COD reduction	65-70%
Final BOD value	5000 mg/lit
Final COD value	24000 mg/lit
Biogas production	0.5 m^3/Kg COD degraded
Total biogas production	22444 m^3/day
Cal. value	5600 K.cal/m^3
Equivalent quantity of coal saved	31.42 MT/day
Fuel saving	93%

The cost of methane gas plant is approximately Rs. 170 lakhs. The complete project shall cost about Rs. 200 lakhs. The pay-back period works out to only three years. The methane gas project requires 15-20 months for execution and regular commissioning.

In spite of great advantages which can be achieved by installing methane gas plant, very few distilleries are coming forward to select this process. The digester effluent is still left with high BOD of 5000 mg/l. The distilleries are doubtful as to the possibility of further degradation of the effluent to 100 BOD by adopting lagooning and aeration in the context of unfavourable economics and high power requirement. One distillery in Gujarat having methane gas plant using thermophilic bacteria claims that it has achieved a BOD level of 500 mg/l by lagooning the digester effluent at BOD 5000 mg/l and further aeration by surface aerators. The general opinion of technologists is that a BOD upto 2000 mg/l can be achieved by treating the digester effluent.

Energy recovery from non-conventional source is a great attraction of the process followed by substantial reduction in BOD. Distilleries are repeatedly requesting the Government to modify the BOD limits for treated effluent from 100 to 2000 mg/l so that energy generation system by anaerobic digestion to produce methane gas could be acceptable to the industry. Different technologies of methane gas production like Sulzer, Bacardi, Paques, Degremont etc. are being tried in different distilleries in the country. The process based on indigenous technology is also reported to be working at K.C.P. distillery in Andhra Pradesh.

Concentration and incineration

Another method of recovery of energy from spentwash is based on concentration upto 60% solids and combustion in a special kind of furnace to generate steam and electricity. K.T.I. Italy offered such technology to one of the distilleries in Dhulia District. Considerable time was required for completing formalities with subsequent escalation in price. The project is highly capital intensive and payback period is very long.

M/s. Praj Counseltech have developed a process of Sprannhilator for concentration of spentwash from 22 to 60% by scrubbing with hot flue gases in a Venturi Scrubber. The concentrated spentwash is fired in a special furnace to achieve complete combustion. It requires support fuel of 6 tonnes of bagasse and 105 kW electricity. The method has been recognised by environmental department and pollution control board. One plant located in Kolhapur District for 25 KLPD distillery and another plant in Pune District for 45 KLPD distillery, are reported to offer zero pollution. For distilleries which cannot have any other means of waste disposal system Sprannhilator has provided excellent relief for the time being. It is quite likely that joint venture to concentrate and incinerate the spentwash for generation of system and electricity may come out very shortly. If the cost of plant is economical it will offer a better solution. M/s. Thermax Ltd. have put up a pilot plant for spent wash concentration and incineration in public sector distillery in Ahmednagar district. The operation of plant had a number of constraints. Trials are being conducted after necessary modifications.

It is claimed that the process for 45,000 LPD distillery will generate 13 T/hr of steam which is sufficient for distillery and spentwash concentration plant, and surplus power to the extent of 500 kW. The economics of this process can become favourable if the ash produced after complete combustion fetches a better market value. Experiments in several agricultural universities are being conducted to find its usefulness as a potash rich fertiliser. The distilleries in Maharashtra are very actively considering selection of concentration and incineration method. A private firm has proposed to put up three big size plants at a suitable locality to consume all the spentwash of Maharashtra Distilleries. The firm shall provide reboilers for the distilleries and spentwash storage tanks and shall arrange to transport the spentwash to their site for incineration. The firm shall have alcohol based chemical plant for which all steam and electricity produced will be used or may feed electricity to the grid. The distillery in turn has to pay 25 paise per litre of alcohol produced. Apparently the proposal is attractive because distilleries can get rid of
lution problem. It will however much depend on the perf
ance of technology and success of the contract.

Composting

Four new distilleries have selected method of compos
The method of composting requires press mud from the
factory. The seedling for availability of bacteria is do
using cow dung or composted material. Press mud is st
near the compost pits for natural drying from 50-60% m
ture to 10% moisture. 100 tonnes of dried press mud is pl
in layer in pits and 100 cu. metre of spentwash is lo
The mixed material shall be upto 2 feet. Again 100 to
of press mud is added and, 100 cu. metres of spentwa
sprayed on its top. The whole mass is turned up and d
by excavator type tractor every alternate day upto eight
and then stacked for curing for a period of 25 days. The a
ysis of spentwash compost percentage on a dry basis is g
as follows, for a distillery in Kolhapur district.

	N	P	K	Ash	Vol
Pit 1	1.80	0.69	1.80	35.8	64
Pit 2	1.64	0.59	1.90	30.0	52

Samples of compost from a distillery in Pune District g
the following analysis (%).

	Compost age days	N	P	
Sample No. 1	10	2.0	0.8-1.1	2
Sample No. 2	20	2.6	0.6-1.3	1.5-
Sample No. 3	30	1.92	0.5-1.2	1.7-

One distillery in Kolhapur district has selected a bio
system of Fabcon, Phillipines. In this process organic w
decomposition is properly controlled. It yields nutrient
biologically active soil builder. Filter mud is used with sp
wash. C:N ratio is balanced by proper blending of raw m
ials. Moisture, temperature and aeration are monitored
controlled using the Fabcon wind row aerotilling mac
which is required to be imported. Total cost of the pr
is about Rs. 75 lakhs for 30 KLPD distillery, adopting
tinuous fermentation technique. The quantity of bio
likely to be available from a distillery of 30 KLPD cap
is given Table 2.

Table 2

	Quantity Tonnes	Moisture content	Dry material	Final product w 10% moistu
Daily spentwash	150.0	120.0	30.0	33.0
Daily press mud	70.0	52.0	22.0	24.75
Total	225.0	172.5	52.5	57.75

laily 58 tonnes of bioearth compost will be pro- oearth is applied one to four tonnes per hectare of ually. It is of particular value for cane, corn, rice, crops etc.

compost material results in waste recycling besides reducing the use of chemical fertiliser, better plant nutritic reduced land depletion and enhanced overall economic vi bility. The performance of bioearth would be available demonstration in the next season. The current status of d ferent treatment plants for handling distillery spentwash Maharashtra is summarised in Table 3.

Table 3
Status of distillery spent treatment plants in Maharashtra

Technology	No.	Remarks
Methane gas	2	One - commissioned One - initial
Composting	3	Commissioned
Sprannhilator	2	One - commissioned One - ready for commissioning
Bioearth	1	Almost ready
Concentration and incineration -steam and power	1	Trials in progress

presented at CESE - IIT, Bombay, State-of-the-Art symposium on Treatment Options — Sugar, Distillery, Pape llied Industries, December 7-8, 1989.

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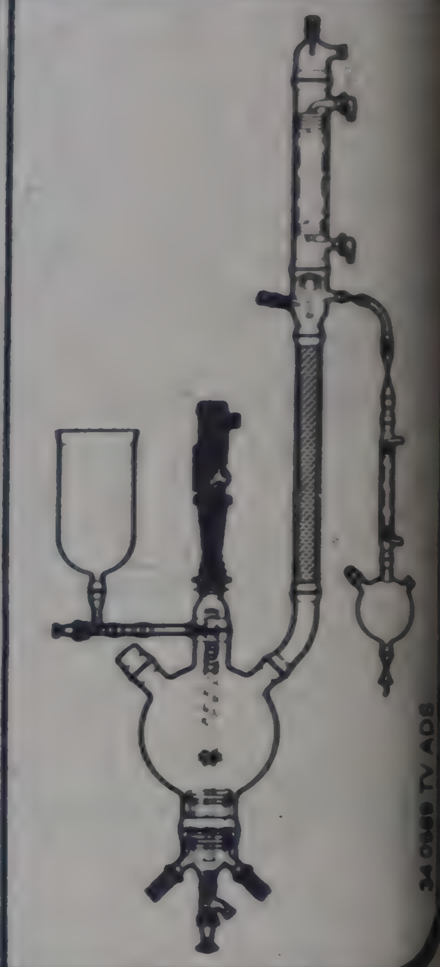

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Indian chemical industries at cross roads

N.S. VENKATARAMAN
f Consultant, Nandini Consultancy Centre, M-60/1, IV Cross Street, Besant Nagar, Madras 600 090.

is no doubt that there have been significant
ment and progress in the performance of Indian
al industries during the last three decades, in various
including the product quality, capacity utilisation,
yout and process control measures. It can be clearly
t the imports of different chemicals are coming down
ear. Several of the products, which were imported in
decade, are now banned for imports, as adequate indi-
manufacturing capacities have been built up. While
e healthy indicators of progress, it has also to be kept
l that Indian chemical industries have not been able
e any sort of breakthrough in the export front.

t from the inadequate performance in the export front,
chemical industries are unable to compete with the
tional industries even within India itself and the pro-
measures by the Government of India in the form of
nport duty and restrictive measures of import have
absolutely important for the survival of Indian chem-
ustries. The sale price of most of the industrial chem-
roduced in India are substantially higher than the
ing international price levels. This is so, even in the
such chemical products, which do not have to import
aterials with high import duty from abroad and whose
aterials are totally available in India itself.

er such circumstances, one cannot but fear that Indian
al industries are structuring their operations in such
hat they would be operating only in the Indian market
g time to come. The Government of India's efforts
k this impasse by encouraging the setting up of 100%
oriented projects by special concessions and the
e import licence schemes have also not resulted in any
ant export growth by Indian chemical industries. This
akes it evident that the export performance of Indian
al industries cannot be improved by mere fiscal and
cessions alone. A greater initiative has to come from
chemical industries, bringing around improvement in
ogy, economy of scale of operations, raw material/-
consumption norms, product quality, product packing
ues and sales policies, with the international market
.

biggest problem faced appears to be in the size of the
al industries itself, which, in turn, effectively reduces
pe of Indian units to operate in the world market. The
ng size of most of the Indian units are so small, that
nnot even afford to maintain an adequate sales force
ote the sale of their products in the competitive world market. When the operative levels are small, there is no possibility of the generation of adequate income to spend money in sales promotion, research and development efforts to update product quality and optimise the cost of production. Such smaller units cannot also afford to invest adequate funds to introduce qualitative instrumentation and computerised process controls, which have become an absolute necessity to stay afloat in the competitive international chemical industry scenario.

During the last few years, there has been import of technology in a big way by Indian chemical industries. Even such import of technology has not boosted the exports of products, due to higher capital costs contributed by heavy project delays and disproportionate level of pre-operative expenses. The various government agencies, including the licensing bodies, environmental control agencies, state owned financial institutions take not less than two years to provide all the licences and clearances.

It takes two years from the date of conceiving the project to the effective date of commencement of project implementation and another minimum of two years for the implementation of even medium sized chemical projects. With the prevailing higher interest burden and depreciation provisions in India compared to advanced countries, the fixed expenses for unit product in India is much higher than the similar products produced in advanced countries. This makes Indian chemical products uncompetitive in the world market.

While the diagnosis of the problems facing the Indian chemical industries appears to be an easy task, the prescription to overcome the problems is by no means an easy one. Obviously, the problems are interwoven with different factors and some of them are mutually conflicting. While the Government of India can certainly help and is helping by constantly reviewing it's export-import policies and concessions, it is very clear that the ball is only in the court of chemical industries. They have to overcome their obsession with Indian market and the requirement of protective measures.

Every one of the Indian chemical industries must make it part of their corporate policy to export atleast a small percentage of their production, even if the price realisations were to be low, as a patriotic duty to the motherland. The profit generated by many of chemical industries are quite adequate, that they can afford to have a dual pricing system, for Indian and export markets, that would not affect their economy in any significant way.

As of now, the investors in chemical industries in India are finding it extremely difficult to find suitable projects with adequate gap in supply in India, for investment. For example, such an important product like acrylic esters have a total annual production capacity of hardly 13,000 tonnes in the country and demand of only 7,000 tonnes per annum. Investors say that there is no further scope for creation of capacity for acrylates production in India in the next few years.

The Indian production of titanium dioxide is less than 0.5% of the total world production of around 3 million tonnes per annum. There is a view that there is scope for only one more titanium dioxide industry in the country of annual capacity 20,000 tonnes before 2000 AD. Many more such examples can be readily cited. This is a very negative appr for the easiest path of operating only in India.

If Indian chemical industries were to fail to e amism and look towards the world market, it is sible that the future growth of chemical industr may take a downward trend in the coming yea

The purchasing capacity of the average Indian become the only basis for growth of chemical India. If this were to be so, there would be no sc duction of several sophisticated chemicals at eco in the near future in India. The Indian chemical certainly, at the cross roads.

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Advances in control of secondary recovery*

was produced from the UK sector of the North Since that time the pace of development has d and there are now approximately 35 oil fields in the UK sector. The development costs for shore fields have been very high and total cap- dividual fields in excess of US $2 billion were unusual. This large "front end loading" led to of covering every performance eventuality and tically without exception the necessary equip- er and/or gas injection has been included in the ities design. In the same manner allowance has or the necessary number of injection wells.

to recover the very heavy development costs as ible has led to very high extraction rates. In the has become normal to have a peak production 10-15 per cent per annum of ultimate recovery. es with depletion rates in the Middle East of less ent per annum. As a result of this high depletion eal of experience of secondary recovery methods quired in a short time period.

r reviews the production performance of several lds in the UK sector. As the reservoir engineer as to resort to analogy it is to be hoped that this will prove useful in the examination of the appli- condary and tertiary recovery methods to Indian

tempts at using EOR (surfactant and polymer) have been thwarted by the continued weakness (especially in terms of sterling). As a result recent with polymers and surfactants has been restricted up of water injection wells and the use of per- locking polymers in wells following severe early through.

to be examined

the high cost of development in the North Sea, that, for a reservoir to be commercial, the aver- lity of the producing horizon must be high. Ini- es in excess of 5-10,000 barrels a day are generally project is to be economic.

average permeabilities are therefore typically of several hundred millidarcies the permeability con- en the better and poorer parts of the reservoir can and it is by no means unusual to find subzones with a permeability in excess of 10 darcies on the high side and less than 10 millidarcies on the low side (a ratio of 100 to 1).

Oil is currently produced from Palaeocene, Jurassic, Triassic, Permian and Devonian reservoirs with the Jurassic reservoir being the most prolific. With the exception of the Permian, all producing reservoirs in the UK sector of the North Sea are clastic reservoirs although significant production from Cretaceous carbonate reservoirs occurs in the Norwegian and Danish sectors.

In general UK North Sea crudes typically have API gravities between 35 and 45 degrees although commercial production has been undertaken where the API gravity is as low as 25 degrees. Gas oil ratios show wide variation, even locally, and range from less than 100 cubic feet per barrel to about 2,000 cubic feet per barrel. The corresponding viscosities are low generally being less than 2 centipoise and always less than 10 centipoise. Mobility ratios therefore range from favourable to marginally unfavourable with the result that recoveries under water injection were expected to be high and that prolonged periods of high rate water free production were anticipated. In practice although the recovery factors will broadly reach those predicted, water breakthrough has occurred much earlier in the field life and the high recoveries will only be obtained having circulated large volumes of water.

In most areas of the UK sector the reservoirs are significantly faulted with the result that associated acquifers range in size from very small to moderate. The perceived necessity for water injection has therefore become a reality. Only in one case, which will be discussed later, has the original equipment installed on the platform turned out to be redundant. However, even in this case the initial decision to include the equipment was correct because no guarantee could be given of the size of the associated aquifer before production commenced.

Most North Sea fields of Jurassic age and older are over pressured (effective gradients measured from surface of 0.6 to 0.8 psi per foot being common). Furthermore the bubble point pressure is frequently much lower than the original reservoir pressure. Natural depletion recovery factors would, therefore, be low in the absence of water drive and commonly would not be greater than 10 to 15 per cent. Given that the average recovery factor predicted for North Sea fields in general is in excess of 40 per cent the advantages of water injection are clearly evident.

In order to fully exploit the water injection potential of

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ted by Robertson Erc Limited at the Offshore Oil & Gas and minar, held in January 1989.

these North Sea Fields, significant use has been made of the Repeat Formation Tester (RFT) and production logs (PLT). These tools have proved invaluable in assisting the process of refined reservoir description. The integrated geophysical, geological and petroleum engineering teams are therefore able to act in concert in creating a field description which fits all the available data.

Field examples

Palaeocene Reservoir - Forties

The Forties field is the biggest in the UK sector of the North Sea and is currently estimated to have an ultimate recovery of 2500 MMstb.

The field was discovered by BP in October 1970 and production began in September 1975. The field is produced from 5 fixed steel platforms and a total of more than 100 wells have been drilled of which 80 are producing wells and 20 are water injection wells. The plateau rate was about 500 Mstb/day and is currently about 250 Mstb/day. Water injection rate is currently approximately 450 Mbbl/day.

The field is a broad anticlinal structure with four-way dip closure and is about 90 square kilometres in area with a vertical relief of about 600 feet. The reservoir comprises sandstone of Palaeocene age. The reservoir is normally pressured with an initial pressure of 3200 psig and a bubble point pressure of about 1200 psig.

Natural water influx has occurred providing strong bottom and edge water drive. In order to maintain an adequate rate, water injection commenced early in the field life. The advance of water is strongly gravity controlled and in many ways this reservoir may be said to be behaving in text book fashion. Previous estimates of recovery factor are about 50 per cent, although it is now expected that recoveries as high as 60 per cent will be achieved with the widespread use of artificial lift at high water cuts.

Cretaceous Reservoirs - Claymore

The Claymore field was discovered by Occidental in May 1974 and commenced production in November 1977. Although there are four oil bearing horizons the main reservoirs are of Jurassic and Cretaceous age. The Jurassic contains approximately 800 MMstb while the Cretaceous contains about 350 MMstb. This discussion will consider the Cretaceous reservoir only.

The Cretaceous reservoir comprises sands which are deposited in a system of fan channels. The sands which can be very calcareous are best developed close to the main structure with thinning and decreasing reservoir quality away from the structure. Porosities range betwen 20 and 25 per cent and permeability is between 200 and 700 millidarcies.

The reservoir is being produced under water injectio wells initially produced are at rates of up to 15,000 From the advent of water breakthrough however oil dramatically over a period of less than one year wit cuts rising equally quickly. Wells consequently have tively limited life after water breakthrough which is no pected in view of the favourable mobility ratio of the system. The flank wells in the Cretaceous have already ited this performance and even one of the central w now producing water. It is therefore to be expected the in the field life the reservoir rate will decline dramat as the last of the wells go to water. An overall recovery between 40 and 45 per cent is expected.

Production logging has been crucial in determinin overall perforation and recompletion policy in this str reservoir and without adequate attention to detailed voir management the recovery factors would have been lower.

Jurassic Reservoirs

N.W. Hutton

The N.W. Hutton field is one of several Jurassic fiel uated east of the Shetland Isles in the northern part UK sector of the North Sea. The field lies in a water of 470 feet. The field was discovered in March 1975 an lowing appraisal drilling a seabed template was installe pre-drilling commenced in late 1979. A single piled steel form was installed in late 1981 and production comme in April 1983.

The reservoir comprises two main fault blocks and tains approximately 1000 MMstb of STOIIP. Top rese is at approximately 11,200 feet with the majority of the voir being below 11,500 feet.

The production history of fields in this area which menced production earlier than N.W. Hutton has been variable. Huge permeability contrasts exist within each fields with lateral continuous streaks of very high per bility being common. This has led to very high initial productivity (rates in excess of 30 Mstb/day being com place) but also very fast breakthrough of injected water. fields in the area were expected to have recovery fact between 40 and 50 per cent after circulation of several volumes of injected water.

It should be noted that prior to N.W. Hutton all the that had been developed were at less than 10,000 feet. In Hutton severe in-situ degradation of permeability has o red due to the presence of "fine threads" of illite acros pore throats. This renders a significant portion of the voir non-net under in-situ conditions.

ly this was not a recognised pre-production as
core cleaning destroys the lattice network of
ermeabilities as measured in the laboratory are
ly good. The net effect was to reduce the
rate of 100,000 barrels per day to less than
per day as the well production rates showed
eclines (decline rates of 20 to 30 per cent per
normal).

water injection led to severely channelled flow
emaining high permeability zones and it is only
eservoir management that the operator has been
to compensate for the very adverse reservoir
e expected ultimate recovery from N.W. Hutton
barrels being some 15 per cent of the total oil
me 30 per cent of the effective oil in place (i.e.
h is present in permeability above 1 millidarcy
conditions).

d the RFT tool has been invaluable. Reservoir
trasts in excess of 5,000 psi are not uncommon
bined with the high degree of faulting has led
licated water movements. The combination of
and RFT analyses has allowed a comprehensive
nme to be conducted. Without this programme
ould have been significantly lower and the field
been unable to achieve an economic return.

te contrast to the N.W. Hutton field the Fulmar
was discovered in November 1975 and com-
duction in February 1982, has significantly
ial production forecasts. Reservoir quality is
permeabilities averaging several hundred mill-
with a total reservoir relief of up to 900 feet the
formance is strongly gravity controlled.

36 well slots were provided only 30 wells have
nd the reservoir continues to produce at a capac-
35,000 barrels per day. Because the production
gh on structure and the injection wells are sit-
quifer, water breakthrough to date has been very
overall recovery factors are expected to be high
exceeding 50 per cent. Unlike N.W. Hutton, the
uires little day to day detailed production man-
he gravitational effect means that sweep effi-
very high.

ervoirs

nds in producing fields in the UK sector of the
e generally of poor quality (relative to other hor-
gnificant production has only been obtained from
Lewis reservoirs of the Beryl field. The zones
heavily compartmentalised and as a result only
limited water injection has been attempted. Depletion recoveries are low — normally 5 to 25 per cent.

Permian Reservoirs

Two examples exist of Permian production in the UKCS, the Argyll and Auk fields. The Argyll field produces from two formations, the Zechstein carbonate formation and the Rotliegendes sandstones while the Auk field only produces from Zechstein. Unusually for the UK sector of the North Sea both these fields have been produced under strong natural water drive. Given the highly faulted nature of both fields is somewhat surprising but is attributed to the faults being "leaky".

The Argyll field uses a floating production system which does not have water injection facilities. The Auk oil platform was conventionally equipped having water injection facilities but these were never used and have recently been removed. Because of the faults and the vugular nature of the Zechstein carbonate, prediction of water movement has been very difficult in both fields and a significant programme of infill drilling has occurred in Argyll resulting in large increases over those initially accepted. By North Sea standards both fields are small and ultimate recovery is expected to be in the 70 million barrel range for Argyll and 85 million barrel range for Auk.

Permeability contrasts are not marked within the carbonate zone and it is the broken up nature of the field which causes irregular sweep. This has resulted in a long period during which both have experienced high water cut production. The Rotliegendes sandstone reservoir in Argyll is of much more variable quality and some parts do not respond particularly well to water drive.

Devonian Reservoirs

The Buchan field is an east-west oriented horst in the Outer Moray Firth Basin, about 95 miles to the north-east of Aberdeen. The average water depth is 400 ft. The structure is located mainly in UK Block 21/la, but it also extends into Block 20/5a. The field came on stream in May 1981, and by 1st June, 1987 had produced 54.8 million barrels of oil.

The Devonian reservoir comprises a sandstone which is extensively faulted and fractured, and is bounced by major faults. The major horst area of the field covers about eight square kilometres. The oil reservoir is found at depths from about 8,500 feet and extends down to an oil water contact at about 10,400 feet below sea level. The Buchan field reservoir consists of a tight, low porosity, sandstone/siltstone matrix, through which an extensive fracture system occurs.

The reservoir in the Buchan Field was originally significant over-pressured. Current field performance suggests some form of pressure support from the underlying aquifer. This suggests a more efficient recovery than previously considered likely. The well productivity ranges from 1,000 barrels of oil per day for a flank well outside the main horst structure to 10,000 barrels of oil per day on the horst.

A gas life artificial lift system has been installed since 1985 to assist liquid recovery from all wells. The production facilities on the floating platform are adequate for the gross fluid volumes expected to be handled. At present the field is performing better than earlier estimates suggested, and subject to good oilfield practice this improved performance is expected to continue. Current programmes are designed to determine whether further development drilling is justified to maintain production.

Enhanced oil recovery

Several years ago it would have been expected that EOR techniques would have found wide applications in the North Sea. Indeed a pilot flood of low concentration surfactant had been produced and agreed for the Forties field and several other studies were well under way. The precipitous decline in the oil price in 1986 led to a significant curtailment of plans. To date in the North Sea the major experience of surfactant has been associated with clean-up of the near well bore area of water injection wells. The purpose of this clean-up was to remove, as much as possible, any residual oil thereby significantly increasing the water injectivity.

Polymers have also been used in the North Sea mainly by back injection at production wells. The objective of this injection has been partially to block high permeability streaks. These treatments have met with variable success but have on occasion reduced water cuts from 90 per cent plus back to less than 30 per cent with a concomitant increase in the oil rate. Unfortunately this improvement has tended to last for a period of no more than six months and the economics associated with polymer injection is at best unproved.

It is not clear at this stage whether the oil produced over the six month period is simply accelerated oil or is indeed
incremental. Should the latter be true, polymer in
this type is worth carrying out. If the oil is simp
rated then the economics are distinctly unfavour
factant studies continue to be performed in the N
sector and simulation results in the Statfjord field
sufficiently encouraging that it is intended to carry
flood in the early 1990s. It should be stressed tha
icant recovery in the price of oil would lead to a
of interest in EOR techniques.

Conclusions

Water flooding performance in the North Sea h
ally been very good. Comparison with prediction
commencing significant reservoir development h
that the recovery factors of 40 per cent plus which
dicted can be achieved. However, in order to ach
recoveries it has been shown that much greater v
water have had to be circulated through the reserv
advance of the water has been much less regular
originally predicted. This irregularity is due to a
tion of the very variable permeability and also i
measure to the rate of off take. This rate of off tak
allow gravitational influences to be great leading
formance which is completely dominated by visc
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hemical news from abroad

.ANS ACETIC ACID/ FACILITY

planning to build a ear acetic acid/anhydride ility. No details of the tion of the DM200m ave been revealed. At the company announced the st Celanese's PVC films

in Frankfurt, Hoechst . Wolfgang Hilger said for the new plant are cur- studied from the aspect of ailability, with a decision nced shortly. Start-up is r early 1994.

unit will not, however, gnificant increase in exist- id/anhydride capacity. The lity will replace two older nkfurt and Knapscak, with ties for 350,000 ton/year. lder plants utilize ethylene e new unit will operate on carbon monoxide accord- ology newly developed by

ion of the new acetic ac- plant, which will secure rials for Hoechst's produc- made fibres, polymer dis- armaceuticals, agrochemi- vours and fragrances, is not increase output but cut explained the use of meth- n monoxide as the feed- vide relief from "strong s for ethylene".

me time, Hilger hinted that a carbon monoxide source an important role in the cation, adding that metha- cks would "provide no n problems". As start up is or early 1994, the possib approval of the plant could also be an important factor, he said. Analysts believe this would favour the Knapsack site in North Rhine-Westphalia, as authorities in that state have a reputation for approving industrial plants more quickly than officials in Hesse.

Meanwhile, Hoechst Celanese has sold its PVC films manufacturing activities to the US films group American Mirrex. The business has been completely absorbed by Mirrex which has its activities, like Hoechst Celanese, based in Delaware.

A spokesman for Hoechst said the US business was not competitive owing to the shortage of in-house access to feedstocks. Retaining the business would have meant considerable investment in improving production facilities, funds which the company prefers to spend on the much larger polyester films business.

ICI TO PULL OUT OF COMPOSITES?

ICI may pull out of hi-tech area of advanced composites, suggested chairman Denys Henderson in a recent television interview. Although it is an area with exciting growth prospects, there is a lot of competition and "it is not making much money at the moment," he said.

ICI has been active in this sector for almost five years and will remain there in the short term. However, the company has to decide whether it is a business where it can made good profits in ten years' time, said Henderson. "We certainly have the science, we certainly have the chemistry, we certainly have the knowledge of the marketplace, but whether in the end of the day we will make money out of it, we are not too sure".

Prospects are bright, however, for the hybrid seeds area, where ICI has been active for 7-8 years, according to Henderson. The company has been building in this sector by research investment and acquisition, "and there are some pretty exciting signs that by the end of the next decade that will really be making a very significant contribution to ICI," he added.

Henderson said he was not concerned about a possible break-up or takeover of ICI, because the strong inter-relationship between all the technologies would make unbundling very difficult.

ABB AGREES BID FOR COMBUSTION

Asea Brown Boveri (ABB) the European electrical engineering group, has announced an agreed bid for $1.6bn for US power and engineering group Combustion Engineering.

Combustion which concentrates its petrochemicals operation under its subsidiary Lummus Crest, said chemical activities contributed around $1bn/year to sales. Although ABB would not comment on its plans for Combustion's petrochemicals operations, sources say it has expressed a desire to develop and invest into this area.

A spokesman for Lummus said the venture was a move that Combustion had been seeking for some time and is confident that it will gain a strong base to grow within Europe. "There are invitably many oppotunities for construction and expansion within Eastern Europe and we believe we are in a position to take advantage of these," he added.

WEST GERMAN FIRMS SEEK EAST LINKS

West German chemical major BASF says it is keen to take advantage of expansion opportunities within East Germany and would hope to establish the close cooperation it had prior to the second world war. Market observers say other companies which are also in a position to take advantage of recent developments within East Germany include Hoechst, which operates its own engineering arm Uhde. Other companies actively pursuing projects in the area include Schering and Veba.

Veba, which already procures chemicals in East Germany, says it has other projects in the pipeline.

Meanwhile, Schering is currently seeking technological exchanges in East Germany.

Sources expect a trend towards revamping petrochemical projects within East Germany. "It is also very likely that as living standards improve, there will be a trend towards speciality chemicals in East Germany," said one London analyst.

The West German government has already shown its commitment towards investment in East Germany through a DM300m ($161m) five-year environmental project.

Market observers say the West German government is expected to continue to explore any cooperation opportunities within East Germany.

However, there are obstacles, said a spokesman from BASF, such as difficulties in obtaining private land and the unstable East German currency.

Meanwhile, looking at the other side of the coin, analysts are expecting West German chemical companies to benefit from the influx of East Germans into West Germany as the constuction and automobile industries boom.

GL TO STREAMLINE

Great Lakes Chemical Corp. is considering the sale of either part or the full 40 per cent of its stake in Huntsm Chemical Corp.

Discussions about the sale are ongoing tissue, said a Great Lak spokesman, who explained that th group wanted to concentrate on its sp cialities business rather than polystyre and commodities.

Sources say head of the group Jo Huntsman wants the stake bac Huntsman claims that he can take mor risks, such an increasing debt, if he not answerable to a shareholder.

Great Lakes is the one piece of th Huntsman holding that is outside fam control.

Meanwhile, Aristech Chemical Cor has delayed its decision on the propos acquisition of Aristech by Huntsman fo $1bn. Aristech's chairman and ce Thomas Marshall said that a decisio would be taken shortly.

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Chemical markets abroad

YLENE PRICES DIP AS
T OPTIONS RECEDE

ylene spot prices have slumped
600/ton fob NWE, as European
t sellers feel export opportun-
e receded, at least until the year
r the last month European
s have remained stable at
0/ton fob NWE, with specula-
future export potential support-
es.

market appears to have con-
that Sunkyong's 160,000 ton/-
uth Korean PTA plant will not
nmissioned in the near future.
ant had been expected up at the
ng of quarter three.

nosa Chemicals and Fibres Co.
), has given no indication of
t expects its 200,000 ton/year
nese PTA plant up. This unit was
lly expected to be commissioned
this year. Between them the two
vould have consumed approxi-
150,000-200,000 ton of para-
in 1989. Many players had
l on these plants coming on-
and so had committed paraxy-
the Far East. Observers say a
ely large overhang of product
in the region.

indication of the lengthening
t in the Far East is shown by the
at the last three Indian tenders
ourced out of South Korea. India
ieved to have secured all the
ylene it will need in 1989, putting
her dampener on the merchant
t. Debottlenecking of existing
nd the re-structuring of its buying
, has left India less dependent on
ot market.

proximately 5,000 tons of mater-
been sold at the lower spot price
95-600/ton fob Rotterdam. Trad-
thought to have sold quantities
duct to a European producer, which has yet to complete its maintenance turn around.

In the past months, export opportunities out of the US have diminished. The country's PET industry has gone through a phase of being relatively uncompetitive to the Far East. Prices have now fallen and the industry is in a better position to exploit the export opportunities. The US East coast currently has no spot requirements and overall the paraxylene market has gone from tight to long.

Another factor leading to lower paraxylene prices has been the decline in downstream polyester staple fibre production in the Far East. Taiwan had committed a great deal of capacity on China re-entering the staple polyester fibre market market as a major buyer. Because of limitations in foreign currency, Chinese purchases have been much lower than expected. Taiwanese staple fibre producers have now cut back production by some 30 per cent, to compensate for the lack of exports. Fortunately strong polyester filament demand has partially compensated for the reduction in exports to China.

The world paraxylene market appears to be relatively long. Some players feel the present surplus will be a short-term phenomena. Worldwide expansions in PTA and DMT capacities, due on stream in 1990 and 1991 are cited as factors in mopping up any paraxylene surpluses. Meanwhile, predicted strong growth in PET and polyester fibres could also bolster paraxylene usage.

CHINESE IMPORTS PLUMMET

China's imports of hdPE/ldPE look set to drop to 500,000 ton/year in 1989, from the heights of 900,000 ton/year in 1988, according to Houston consultant Pace. Polypropylene imports are also predicted to slump from 467,000 ton/-year to 300,000 ton/year, in the same period. Underpinning these developments is June's political upheaval plus the lack of foreign currency available to importers. Throughout 1989 producers have noted that lack of foreign exchange has impeded China's imports. With the economy overheating in 1988, the government took a series of measures to reign in inflation and slow consumer growth.

According to Pace, over 50 per cent of ldPE used in China goes into agriculture, with 30 per cent used in packing. The remainder is used in a welter of miscellaneous end-uses.

China's production levels look set to race ahead into the mid-1990s. In 1988 ethylene output reached 1.2m ton/year, and is predicted to rise to 2.5m ton/year by 1995.

Propylene production will grow from 680,000 ton/year to 1.4m ton/year, in the same period., Benzene levels will almost double from 520,000 ton/year in 1988, to 900,000 ton/year in 1995.

China's petrochemical industry is predicted to show a growth rate of 10-11 per cent/year into the mid-1990s. Paraxylene output, which stood at approximately 300,000 ton/year in 1988, should rise to 500,000 ton/year by 1990, reaching 900,000 ton/year by 1995.

Continued hesitation by foreign investors could hinder the growth of China's petrochemical industry, the consultant warns. Lack of foreign currency could provide another major problem. One other area of concern is the infrastructure, which is in need of development.

US PHOSPHATE ROCK PRODUCTION RISES

US production of marketable phosphate rock rose to 49.7m ton during crop year 1989 (1 July, 1988 to 30 June, 1989), an increase of 15 per cent over 1988 production, says the Bureau of Mines, US Department of the Interior.

The amount of marketable rock soldor used increased by approximately 8.9 per cent from 45.8m ton in 1988 to 49.9m ton in 1989.

Apparent consumption during crop year 1989 was 42.3m ton, about 10.6 per cent more than the 1988 level of 38.3m ton.

According to statistics collected by the Bureau, phosphate rock exports for crop year 1989 amounted to 8.5m ton, an increase of about seven per cent on the 8m ton exported in crop year 1988.

The Bureau of Mines says the value of exports has risen from $24.08/ton to $27.38/ton fob mine over the same time.

However, the US Bureau of the Census claims that phosphate rock exports for crop year 1989 represent 9m ton although it does not supply figures for the value of such exports.

OCCIDENTAL STARTS UP POTASSIUM SULPHITE

Occidental Chemical Corp. has entered the liquid potassium sulphite market with the start-up of a production facility at its Niagra Falls, New York, speciality chemicals plant.

The unit, built at a cost of over $1m, came on stream recently. Oxychem claims the agreement is tangible evidence of its continuing commitment to supplying the Puerto Rican markets.

To Fairbank Corporation of Hato Hey, Puerto Rico, which serves as Oxychem's sales representative, has been authorized to accept purchase agreements for delivery from the new terminal.

ITC MARINE DOCK

Intercontinental Terminals Company (ITC) is to operate a new mar at Exxon Chemical Com Anchorage marine terminal on t sissippi River at Port Allen, Lo

The dock is currently under co tion and is scheduled for comple the first quarter of 1990.

It is designed for use by bot and world-scale tankers.

ITC and its affiliates provide plete range of serices and facili the liquid and dry-bulk storage r ments of the petroleum, chemic petrochemical industries.

The company operates its 200-acre terminal on the Housto Channel at Deer Park, Texas an ates and maintains major prop terminals in Baton Rouge, Lo and Tampa, Florida.

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Plastic markets abroad

ABILIZES AS PRICE RECEDE

polymer market has
ree of stability, with little
urther price erosions. It
rm producer discipline on
city rates plus convertors'
e-stock earlier-depleted
ave buoyed prices. How-
s attempting to go beyond
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ontinues to gain in confi-
w feels that a platform has
hed for some price devel-
h traders and convertors
current recovery is not as
as producers would have
. General purpose high
es are still said to be avail-
ively low numbers, while
mpetition amongst produc-
ng prices down.

emerging that export poten-
g up and providing further
s for producers and traders.
hifting from suppliers to
ve some indication of the
arket. Producers note that
months have seen a signif-
ion in stocks. It has been
t inventories have dropped
per cent in certain sectors.
evious eight weeks, total
en 10 per cent higher than
year, say suppliers.

of scheduled plant outages
to tightening supplies.
majority of shutdowns are
even completed, they are
ing the market. Some pro-
believed to be undergoing
n recommissioning units,
e perception of tightening

m a willingness to reduce capacities, producers appear to be increasingly willing to consider closing older units. The latest closure is Appryl's 10 year old Lavera 100,000 ton/year polypropylene plant. This trend is more prevalent in polymers which have experienced new capacities in the past year.

European polypropylene prices have steadied, with no further price loss noted. Producers' attempts to bring prices at the lower end of the range into line appear to have been successful. However, attempts at an overall price hike have not really materialized with posted figures being pegged back. PCD's West German plant has yet to be commissioned although this is expected shortly. Uncertainty also surrounds the new Beaulieu unit, which was due on stream earlier in the quarter.

Raffia grade numbers are stable at DM1.40-1.45/kg. Although small deals may have been concluded below this level, these are not thought to be representative to the market. Injection moulding grade numbers have shown little movement. Despite increased sales which have depleted inventories, prices range from DM1.55-1.70/kg.

Copolymer is one area where vigorous competition for market share is hitting numbers. Activity has seen prices dip to DM1.70-2.00/kg. Lower numbers are believed to be available, although these remain unconfirmed.

Low density polyethylene (ldPE) continues its recovery. Scheduled maintenance turnarounds have diminished supplies. Buyers are fairly activeshifting inventories from producers to convertors. Several suppliers are pushing for a uniform European price, leading to some price rises at the bottom end of the range. Attempts to hike ldPE prices to DM1.70/kg do not appear to have been too successful. Prices range from DM1.60-1.65/kg.

As oversupply continues to afflict the lldPE market, the gap between lldPE and ldPE is still great. Demand has been stable rather than strong. Blender ability to substitute lldPE and ldPE could decrease any price differential. LldPE numbers are quoted in the range of DM1.52-1.56/kg, with lower numbers being talked.

Hdpe has been psychologically affected by the explosion and outage at the 675,000 ton/year Phillips Pasadena hdPE unit. With the US market seen to be long, the shutdown does not appear to have affected global prices.

European hdPE remains balanced and has drifted to long on certain grades. With cheaper export product available in the market, the general purpose high volume grades face downward pressure. Injection moulding ranges from DM1.60-2.00/kg, but exported product is quoted below the market range. Blow moulding continues stable at DM1.80-2.05/kg, with speciality grades representing the higher end of the range. Film grade product is stable at DM1.75-2.05/kg.

Polystyrene prices remain much the same as last month, in the range DM2.25-2.35/kg for general purpose and DM2.35-2.45/kg for high impact grades. Producers had hopes to raise prices to around the DM2.40 level for GP and DM2.50 for HIPS, although these have not been fully realised. Demand is currently strong, especially in the seasonal electronics and toys sectors, and availability is also good.

Producers report that October production and sales were very much in balance but that a slight level of destocking took place.

Imports of materials from Brazil and Mexico, which looked to be increasing in the summer, are not now having an impact because of increased home demand and the biting of EC duty tariffs from mid-October.

News about new projects

CONTENDERS FIGHT FOR STAKEIN BRAZIL'S ITAGUAI COMPLEX

Following the creation of PetroRio, plans have firmed up for Brazil's Itaguai petrochemicals complex. The basis of the project is a $1.1bn. cracker, on the outskirts of Rio de Janeiro city, with ethylene capacity of 545 000 ton/year, scheduled for completion in 1996.

PetroRio's chairman, Oswaldo Peckolt, says the raw materials capacity will include 220,000 ton/year propylene, 69,000 ton/year butadiene, 270,000 ton/year benzene, 175,000 ton/year paraxylenes, 10,000 ton/year orthoxylenes, 43,000 ton/year pyrolysis residues, 50,000 ton/year MTBE, 74,000 ton/year solvents, 150,000 ton/year LPG and 120,000 ton/year gasoline.

Peckolt says he has never known such intense competition for projects in the 20-year history of Brazilian petrochemical complexes. Proposals for nine downstream projects have been made by 36 companies encompassing nationals, multinationals and companies which have a state-owned partner, as is characteristic of Brazilian industry.

Competition for alpha olefins and PTA is a little easier, comprising individual bidders, an association of Deten/Shell and a consortium of Petroquisa, Mitsubishi, Pronor, Rhodia and Celbras. Meanwhile, some eight companies are fighting for lldPE, ldPE and hdPE, with a combined 200,000 ton/year capacity. Two international companies, Union Carbide and Solvay, are competing for PE.

The Brazilian industrial development secretariat has introduced progressive criteria to select proposals for downstream projects. Tenders will have to include a bid for shares in PetroRio. At the final stages of selection, those bidding for a large number of shares will have priority.

This new mechanism, according to Peckolt, will secure the feasibility of the Itaguai complex. He quotes Leonardo da Vinci: "All projects are doomed to remain mere projects without the needed resources for their implementation."

The major source of financing will still come from Petroquisa, its subsidiaries and associated companies, which hold shares amounting to 65 per cent of PetroRio's capital. BNDES, the Brazilian National Development Bank, will also hold preferred shares.

Capital for the project is to be raised to some $600m, with loans coming from local sources and foreign capital. The Brazilian petrochemicals industry has a total turnover of $11bn. and assets of some $14bn. says Peckolt, stressing the sector's cash flow ability to carry out the proposed petrochemicals development.

The estimated investments for PetroRio do not include the costs for centrals to thermal energy generation, production of industrial waters and for solid and liquid effluents treatment.

Peckolt has estimated the maximum cost for waters production at $40m, while for the other utilities, investments will depend on downstream projects.

It is likely, Peckolt says, that a cooperative system will be adopted to integrate the capital of PetroRio and the three centrals for energy, water and effluent treatment. The latter, especially, depends on the technology to be adopted by downstream projects.

STATOIL AIMS TO RISE IN POLYOLEFINS LEAGUE

As part of its recently announced campaign to be Western Europe's fifth or sixth polyolefins producer, Statoil has revealed it is planning to build a se line at its North Sea Petrochem joint venture with Himont at Ant The second unit will be identical t first, producing 180,000 ton/year

Himont's latest version of its Sp ipol PP process will be used, and Products' Catofin propane dehydr nation technology for propylene complex will be fully integrated, propane from the North Sea.

Statoil says this will be the first E pean plant to use propane dehydr nation. Other plants which will us technology include an NPC Thai and a Venezuelan plant, both under struction.

Himont and Statoil have equal s in the project and will market the duct under their own labels., Stato sales outlets in West Germany, Fr and the UK, as well as in Den Sweden and Finland. It also has in Italy and the Benelux. The com aims to expand sales within the E pean Community.

Meanwhile, in polyethylene, company has announced plan increase its production outside Sc navia to 300,000 ton/year. It is curr in talks with other major produ looking at the possibilities of joint tures, buying into existing projects increasing processing capacity. A pany spokesman confirmed: "Wha we do, it will be with partners."

Statoil's current PE capacity (in ing projects underway) totals 2 ton/year. The Bamble hdPE expa is due for completion in early 1 output totals 120,000 ton annuall an additional 10,000 ton of com ing capacity.

The second PP line at Antwerp an additional 300,000 ton of PE bring Statoil's total polyolefins ity to around 860,000 ton/year

News from abroad

ATION INTO PHILLIPS

ber 23, explosion at Phillips
(Bartlesville, OK) Houston
Complex at Pasadena, Tx
ople and virtually destroyed
ene (PE) reactor at the site.
r was 'foreseeable' accord-
ert E. Wages, vice president
hemical and Atomic Work-
tional Union (Denver). The
ble causes of the accident
ulty maintenance procedures,
ess-experienced sub-contract
ce crews, and an inherently
ctor design.

nber 6 PE reactor, where the
occured, vented its contents
mosphere through an open
lve.

removed through six settling
base of the reactor that can
d by closing a block valve.
gs are periodically unclogged
actor still in operation. At the
e accident, reactor No. 6 had
leg removed for servicing. A
evice should have been placed
lve and air-line valves be
e system should also be iden-
eing locked out with "DO
E" tags. But according to
hillips maintenance lock-out
inconsistent with standards
d by Occupational Safety &
ministration (OSHA) because
ce workers do not have to
s with personalized IDs on the
d there are no accompanying
n tags on the valves or in the
om.

ation showed that the Demco
the reactor was in the open
nd the lock-out device on the
ot in place. Air control lines
attached and at lease one air
ve was still open. A prelimi-
stigation showed the settling
leg was only partly assembled. The large valve separating the leg from the reactor loop was in the open position, which could allow hydrocarbons in the reactor to be released into the atmosphere.

A subcontracting crew from Fish Engineering and Construction (Houston), was at work on the reactor when the massive release occured. Fish Engineering personnel were employed as no labour agreement was required and the firm charged 35% less than what a Phillips employee would have to be paid. It had been determined that Fish did not have its maintenance crew lock out or properly tag the Demco valve.

In August, a lock-out accident occured at the same plant, leaving one union member dead and four people injured. Fish Engineering subcontractors opened piping to an off-gas scrubber tank without isolating the line. This vented flammable solvents into an adjoining work area. OSHA proposed a $1,400 fine for this incident.

It was contended that the design of the PE reactor was flawed. It did not include fail-safe systems that could automatically shut a valve that was improperly venting to the atmosphere. It had no high pressure dump and flame system to allow the leaking reactor an alternative flow pattern besides uncontrolled release to the atmosphere.

One of the biggest lessons from the accident was "how much the regular workers are at risk from contractor work practices."

The OSHA is preparing new rules for the storage, handling, and processing of highly hazardous chemicals. The rules will require employers to set up management systems to address the hazards of chemical processes, including preventive maintenance, quality control, hazard analysis and employee training. The chemical industry is considered to be far safer than most other manufacturing industries.

But when an accident does occur, it is likely to be of catastrophic proportions.

KEMIRA TO BUILD H_2O_2 PLANT IN JAPAN

Kemira, Finland, has set up a joint-venture with Ube Industries, Japan to build a hydrogen peroxide (H_2O_2) plant in Japan. The new company, Kemira-Ube will use Kemira's proprietary process in a 20,000 m.t./year plant at Ube's chemical complex in Ube, slated for late 1991 start-up. Half the output will feed Ube's downstream production requirements for making such products as nylon and catechol. The rent is to be targetted at the Japanese market, currently in over-supply.

Kemira plans other ventures with Ube, primarily building on Kemira's pulp and paper industry applications expertise.

The joint-venture gives Kemira an international presence in H_2O_2 just a year after start-up of a 20,000 m.t/year. Unit at Oulu, Finland, using its anthraquinone process. Kemira has another project at Rotterdam, the Netherlands, scheduled to start in 1991. Doubling up of capacity at Oulu is under study. Kemira's Chemical business includes the former Americal Cyanamid titanium dioxide business, fertilizer units in the Netherlands, Belgium and the U.K. and water-treatment chemicals.

UBE TO TAX BOILER EMISSIONS

A proposed Clean Air Bill under consideration could levy a sizeable emissions fee on industrial boilers operated by the chemical industry and other manufacturing companies in the U.S.

The Dingell plan would impose a 10-year tax of $55/ton on industrial boiler emissions that emit more than 100 tonnes/year of sulfur dioxide (SO_2). A $45/ton tax would be levied on utilities. The U.S. industrial sector emits about 5 million tonnes/year of SO_2 while utilities give off about 15 million tonnes/year. Fees would apply to cogenerators and independent power producers and government facilities. Boilers operated by hospitals, colleges, universities or residential apartments would be exempt.

The proposal is a part of a plan to spread the costs of acid rain controls expected to be borne primarily by Midwestern utilities. A bill proposed by President Bush on the other hand requires utilities to foot the bill for equipment purchased or actions taken to reduce emissions. The White House opposes any cost-sharing plan based on a fee or tax to industry.

SHELL PLANS FOR MORE EO/EG

Shell Chemical (Houston) is about to announce a plan to build a new 450-million lb. per year. EO/EG facility at its existing production site at Geismar, LA, thus increasing its existing capacity considerably. The company's 830 million lb. per year EO capacity at Geismar is being extended to 870 million lb. per year. If approved, Shell would became the second largest producer of EO, after Union Carbide (Danbury, CT).

The EO unit will be slightly larger than necessary to support an EG unit plus production of other derivatives, and ensure merchant availability. Supply of EO to merchant market has been decreasing since several majors decided to up EO derivatives, production.

Texaco Chemical & Union Carbide major suppliers to the merchant EO market, already announced withdrawal from merchant business sales. They plan to increase production of other EO derivatives, for example fiber-grade ethylene glycol for export and ethanolamines. The merchant EO market has been extremely tight. EO prices have remained stable this year, compared to tabs of many other commodity chemicals. While there has been some slight weakening in prices contract tabs have dipped only recently from 60 cents/lb to about 55 cents/lb and are expected to stay firm much of next year. Union Carbide plans to increase total EO/EG capacity by 1.2 billion lb per year.

Tabs have been drifting in a weak market, producers have been cutting contract tabs to 40 cent/lb. and spot prices are 10 cents/lb. below that level. MEG utilization rates are about 80% in 1989, and should stay around that level until 1991-92. But if all scheduled expansion for EO/EG come on stream, utilization rates could drop down to 67% by 1995.

PP IN JAPAN: HEADING FOR A GLUT?

Mitsubishi Kasei and Mitsubishi Yuka will build two new PP plants in a joint venture, especially conceived to reduce the risk of overcapacity and a disorderly market. The partners will build a 50,000 m.t/year plant at Mitsubishi Kasei's Mizushima complex for mid 1991 start-up. Mitsubishi Yoku formerly Mitsubishi Petrochemical will build an 80,000 tpa unit at its Kashima plant due on stream in mid 1992 and close a 30,000 mt/year unit at the site. The two companies will work in collaboration with Daia Polymer. Total investment in the plants is expected to be $83-93 million. The two Mitsubishi companies had planned to expand PP capacities separately, but Japan's Ministry of International Trade and Industry (MITI) opposed that route, fearing overheating of the PP market.

Quite a lot of PP capacity is under construction in Japan by joint ventures and individual producers. Ukishima Polypropylene grouping Nippon Petrochemical, Mitsui Petrochemical, and Mitsui Toatsu, started up a new 80,000 m.t/year PP plant in Nippon Petrochemical's Kawasaki complex, in November. Three other PP units also started th year--Tonen Sekiya Kagaku's 60,0 m.t/year, unit in Kanagawa prefectu Idemitsu Petrochemicals 40,0 m.t/year plant at Chiba, and Tokuyam Soda's 45,000 m.t/year PP unit at th Tokuyama complex.

In spring 1990, Chiba Polypro-own by Tokuyama, Sumitomo Chemical an Ube will start up a 60,000 m.t/year P unit at Sumitomo's Chiba comple Yokkaichi Polypro owned by Chiss and Toso has a 40,000 m.t/year, pla at Toso's Yokkaichi complex, due t start production in mid-1990. Asa Chemical has a 40,000 m.t/year P plant due on stream at the end of 19 at its Mizushima complex.

Polyolefin sales in Japan are ma through four marketing companies - grouping of several producers set u under MITI prompting during the indu try's period of heavy losses. They ar Daia, Mitsui Niseki Polymer, Unio Polymer and Ace Polymer. Deman growth for automobile of electronic us has made Japan's PP demand outstr that for other resins. In 1988, Japan's P production volume was 1.56 millio m.t. up 11% from that of 1987. In 198 output is expected to reached 1.7 mi lion m.t. But planned expansions o almost 500,000 m.t/year may result i overcapacity in the early 1990s.

DU PONT, STATOIL TO BUILD METHANOL PLANT IN NORWA

Conoco (Houston) the oil and ga subsidiary of Du Pont (Wilmington De), will negotiate with the Norwegia state oil group, Statoil (Stravenger) fo a world-scale methanol and methyl ter butyl ether (MTBE) project.The faci ity will be based on natural gas from th Heidrun field off Norway's west coa that will start up in '96, and in whic Conoco is a major partners. It will con sume 750 mcm/yr. of gas to produc 840,000 tpa of methanol in Norwa The MTBE plant, capacity ranging fro 400,000-500,000 tpa would be bu within the European Community a

News from Japan

O PROMOTE INTERNA- L TIE-UPS FOR FINE- ICS BUSINESS

the aim of promoting interna- o-operation in fine-ceramics ns, the Ministry of International d Industry (MITI) is scheduled lish next spring International rative Council for Fine- s Business (tentative name): the council will comprise of rep- ives from private enterprises, Fine Ceramics Association , Japan Fine Ceramics Centre , The Ceramic Society of Japan blic/university laboratories.

council will promote informa- rsonnel exchange among all ed parties both at home and s and hold international meet- d seminars. Private companies, ities and laboratories have independently sent trainees to arties and accepted them from . The council will coordinate al training in fine-ceramics bus-

I is examining the feasibility of ncil joining the United States, W. ny and Sweden in cooperatively ping gas turbines for automotive e council will be managed by MITI envisages reorganising the into International New Mater- ter (tentative name) some time future.

ceramics are being aggressively ped in Japan, the States and the apan has worked out many l projects covering fine-ceramics ons and is a step ahead of the d EC countries with regard to the ing industrial field concerned.

n's market size for fine ceram- eeded ¥1,000 billion in 1988. Her ramics production accounts for f combined world production. With due consideration given to trade friction related to high tech business, MITI has studied for some time what forms international co-operation in fine-ceramics operations should take.

AUSTRALIAN Al MAKERS START EFFORTS TO SECURE STABILISED CAUSTIC SODA SUPPLY

While there is a world-wide supply shortage for caustic soda, Australian aluminium manufacturers have started positive efforts to secure caustic soda imports. Australia — one of the world's major aluminium producer countries —has drawn up a plan to expand aluminium production in order to meet the increasing demand for aluminium. Accordingly, it has begun to take long-term measures to secure a supply of caustic soda, which is indispensable for aluminium production. Inquiries have come to Japan, too, about the possibility of concluding long-term contracts.

The world's total aluminium output is estimated at 30 million t/y, of which one-third, or 10 million tons, is turned out in Australia. The country is thus a major world aluminium production base. The Australian aluminium manufacturers are Alcoa, Queensland Aluminium, Nabalco, and Worsley. These four companies have drawn up plans to expand production in order to meet the world-wide increase in demand for aluminium. Efforts for the expansion of production by such steps as removal of bottlenecks have already reached a limit. The respective manufacturers are planning to expand production by 30-50%.

On the other hand, Australia relies almost totally on imports for her supply of caustic soda, which is indispensable for alumina production. It has one caustic soda manufacturing company (production capacity: 100,000 t/y). However, the products of this company are used almost totally for consumer items, such as secondary alkali products. So, Australia is importing the caustic soda necessary for alumina production from North America, Europe, Saudi Arabia, and Japan etc. Imports this year are expected to amount to Rs. 900,000-950,000 tons, or about 15% more than the amount imported last year.

The basic unit of caustic soda in aluminium production is 0.9. Australia needs about one million tons of caustic soda every year. It is indispensable for the four aluminium manufacturing companies planning to expand production to secure a stabilised caustic soda supply. Thus these companies have started brisk efforts to secure supplies of caustic soda on overseas markets.

At present Australia is importing 100,000 tons of caustic soda from Japan every year, with the remainder shared almost equally by North America, Europe and Saudi Arabia. The Japanese manufacturers concerned have received inquiries about the conclusion of long-term contracts from such Australian companies as Alcoa and Worsley. However, it is considered impossible for the Japanese side to meet such requests because supply is rather short in Japan as well.

CATALYTIC SYSTEM FOR PP LICENSED TO AMOCO

Mitsui Petrochemical Industries, Ltd. has licensed Amoco Chemical Co. (U.S.) a patent on a magnesium-applied catalytic process for polypropylene (PP) production.

The system developed in 1976 by the Japanese company in co-operation with Himont USA, Inc. (U.S.) is jointly owned by these two companies. It incorporates high-activity, high-stereoregularity catalysts and is regarded as one of the most efficient production technologies for block polymer (polypropylene). It has already been licensed to 34 companies across the world.

Since the catalysts employed for the system have high-level activity, the system itself has a high yield ratio for polypropylene and requires no deliming process. In addition, since the catalysts also have high stereoregularity, the system produces only a small amount of atactic polymer and therefore, calls for no process for removing such polymer.

Due to these advantages, the system is capable of producing polypropylene having excellent physical properties and high-level rigidity and transparency.

BASF SETS UP JOINT FIRM FOR ENGINEERING PLASTICS

BASF Japan Ltd. — a Japanese subsidiary of BASF AG (W. Germany) —and Mitsubishi Petrochemical Co. have jointly established BASF Engineering Plastics Co., on an 80:20 ownership basis to further promote engineering-plastics business. James Atsushi Yoshida, managing director of BASF Japan, has taken office as president.

BASF's nylon 6 and 66 as well as polyacetal were previously marketed in Japan through Mitsubishi Yuka Badische Co., equally owned by Mitsubishi Petrochemical and BASF Japan. The new company handles all these products plus heat-resistant resins including polysulphone.

The company is scheduled to build next year Plastics Applicational Technical Center and a compounding plant on BASF Japan's Yokkaichi site. It intends to provide its customers with excellent service in marketing, technical support and a reliable source of supply, thereby tripling sales in Japan of BASF products within a few years.

The steadily increasing demand from the automotive and electronics industries has brought double-digit annual growth rates to the world's engineering-plastics market. Based on the business experience gained within Mitsubishi Yuka Badishe up to now, it was decided that further business expansion would best be achieved by establishing an integrated business line covering manufacturing, marketing, R & D and technical service in a new company.

MITSUBISHI KASEI, MITSUBISHI PETROCHEM AGREE ON JOINT PP PRODUCTION

Mitsubishi Kasei Corp. and Mitsubishi Petrochemical Co. have announced that they have agreed on a plan to construct two vapour-phase-process polypropylene (PP) plants one after the other by joint investment and have "declared" this to the Ministry of International Trade and Industry (MITI). Such declaration is necessary for MITI to supervise the industry's operations.

According to the plan, the two companies and Dia Polymer Co. — the two companies' joint firm for polyethylene and PP sales — will set up a new company for investment in the planned PP-plant construction and operation of the plants. The first plant with a 50,000 t/y capacity will be constructed at the Mizushima factory of Mitsubishi Kasei (MK) using the vapour-phase process developed by MK. Construction is scheduled to start in April 1990 with operation start-up slated for the middle of 1991.

The second plant with an 80,000 t/y capacity will be built at the Kashima factory of Mitsubishi Petrochemical (MP) with start of construction set for December 1991 and operation start-up for the middle of 1992. It will adopt the vapour-phase process developed by combining MP's technology and a foreign one. When the plant is put into operation, MP will stop operating its existing 30,000 t/y PP plant.

The combined PP-capacity expansion of the two companies will thus come to 100,000 t/y. "The PP shortage is serious here and we have reached agreement on the 2-plant construction in the presence of our joint sales com
there is an interval between co
of the first plant and that of th
I believe this will cause no ma
fusion", says President Masak
of Mitsubishi Petrochemical.

CHUGOKU ELECTRIC B TO BUILD METHANOL

Chugoku Electric Power C
has begun constructing an exp
methanol power plant to help r
contamination of urban air
global atmosphere. Methanol,
known as wood alcohol, is
burning fuel than oil and cou
Japan's dependence on foreig
sources.

The methanol plant is be
structed in Hiroshima Prefect
assistance from Japan's New
Development Organistion (N
government organ which is res
and developing alternate ener
ces to oil and fossil fuels.

The plant system heats a m
methanol and water to generat
gen and carbon dioxide. These
then compressed and ignited
the turbine generator. The pl
have a 1 megawatt output capac
construction is completed aroun
1991 at a cost of about ¥2.5 b
company official said.

MITSUI TO BUILD AMOR POLYOLEFIN PLANT

Mitsui Petrochemical Industr
is scheduled to construct a 10
plant for inhouse-developed am
polyolefin resin (trade name: "
at its Iwakuni-Ohtake factory

The company intends to m
product for use in the manufa
household electrical applianc
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s of infectious diseases
monella, listeria and AIDS
e size of the funds to be
e U.S. firm is not known

ETHYLENE COST HIGHER IN JAPAN THAN IN S. KOREA, U.S.

Japan Economic Research Institute attached to The Japan Development Bank recently estimated the cost competitiveness of ethylene produced in Japan, S. Korea and the United States. It has concluded that combined production cost for ethylene in 1989 will be the highest in Japan, followed by the States and S. Korea, provided all of them use naphtha as raw material and crude oil prices are set at $10-30 bbl.

Prices for raw material naphtha account for roughly 70% of the total production cost for Japanese-made ethylene. In Japan, raw material prices and running costs including fuel cost are generally high due to freight and unique pricing systems for oil products. In addition, fixed costs and personnel expenses are higher in Japan than in the other two countries.

Japan's ethylene industry is now earning large profits but its fundamental competitiveness is low. It will suffer from a decline in plant operation rates and weakening of market prices for ethylene if crude-oil prices rise further. The institute points out that the industry should diversify supplies of raw materials and enhance bargaining power for them so that it can revamp its fragile profit-earning structure. It also advises the industry to build brand-new plants, thus reducing production cost and building up an international competitive edge.

In S. Korea, raw material cost is lower than in the U.S. since the S. Korean government has enforced a ceiling-pricing system. Ethane is staple raw material for ethylene in the States. In actuality, the total production cost for ethylene is lowest in the U.S. since ethane has a high yield ratio for ethylene. It is, however, difficult to establish simple comparisons with regard to the production cost of ethylene produced in the States, S. Korea and Japan, since the latter two employ naphtha as raw material for ethylene. Price regulations for ethane have been virtually lifted in the U.S. As a result, ethane has not gained an advantage over naphtha pricewise.

MARUBENI TO SET UP NEW AGROCHEM PRODUCTION BASE IN MALAYSIA

Marubeni Corporation recently acquired 25% of the total shares of ANCOM, a Malaysian agrochemical manufacturing company. The purpose of this step is to increase the supply of raw materials to Malaysia and strengthen agrochemical sales power in that country. Marubeni has already started investment in ACM, a joint enterprise established in Malaysia in cooperation with Nihon Nohyaku Co. So, its acquisition of the shares of ANCOM is its second step to start a joint agrochemical enterprise in Malaysia. Marubeni's investment will enable ANCOM to start the construction of a new herbicide plant at North Port Crown.

Marubeni has been speedily pushing ahead with its overseas production and sale of agrochemicals since it purchased Helena Chemical, an American manufacturer and distributor of agrochemicals, in 1987. Its recent investment in ANCOM, too, is part of such overseas activities. It will step up such activities further hereafter.

ANCOM maintains its head office and plant at Shahalum. It is engaged in the production of agrochemicals centered on herbicide to be used for rubber, palm and coconut plantations. Its annual sales amount to 30 million Malaysian dollars. The new plant constructed at North Port Crown is to lay major emphasis on herbicide production. Marubeni aims at increasing the supply of raw materials to ANCOM and strengthening its agrochemicals sales power in Malaysia.

It is said that annual sales in Malaysia's agrochemical market amount to M$200 million (about ¥10 billion) and that herbicide for plantations accounts for 80% of this amount. The share of herbicide and insecticide for paddy fields is still small. It seems that Marubeni, too, has started investment in ANCOM for the purpose of increasing the production and sale of herbicide for plantations.

THAI NPC2 PROJECT TO TURN OUT 350,000 T/Y OF ETHYLENE

All the details of Thailand's NPC2 project have been clarified. Recently, "Thai Olefins Company" has been founded for production of ethylene and propylene, and a feasibility study (FS) has been started. It is said that this company's plant will use naphtha as the main feed and can use LNG and light naphtha as well, for annual production of 350,000 tons of ethylene and 270,000 tons of propylene. According to the present schedule, the plant will be completed in 1993.

As for the investment ratio concerned, 51% will be provided by governmental organs (40% by PTT and 11% by NPC). The remaining 49% will be offered by derivatives producer companies, the names of which have already been revealed, in accordance with the amount of ethylene and propylene to be taken over by the respective companies. In addition, "Thai Aromatic Company" will be founded for production of aromatics. According to the present plant, this company will build a plant at Si Racha.

The Thai petrochemical project consists of the NPC1 project and the NPC2 project. NPC1 project was started first. Already completed are facilities for producing 315,000 tons of ethylene by means of ethane cracking and 160,000 tons of propylene by means of dehydrogenation of propane via the UOP process, and those for productio derivatives as polyethylene an propylene.

In the case of NPC2, invest facilities for production of der has been approved by BOI (Inve Committee) of Thailand. Thos panies which are to turn out der will receive the remaining 49% total investment to be made b Governmental organs in acco with the amount of ethylene a pylene they will take over, for ment in Thai Olefins Company

Also, Thai Aromatic Compa become a joint venture, with s vernmental PTT, Exxon Co semigovernmental Thai Oil Co as investors. In the case of the plant, Mitsui & Co. has joined the led by the Bank of Bangkok o land. According to the present sch NPC2's olefin plant will be com in 1993.

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Developments from Japan

S PROCESS FOR
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National Institute for
ganic Materials have
n-carbide precursor
SiO$_2$) and carbon are
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RS SCALE INHIBI-
WATER DESALI-

s developed and suc-
a scale inhibitor for
seawater-desalinating plants based on the multistage flash method. The tests were conducted at a plant of Dubai Electricity Company located in the Jabel Ali area in Dubai, United Arab Emirates with the co-operation of Sumitomo Heavy Industries, Ltd.

The multistage flash method produces fresh water by heating seawater, evaporating moisture contained therein by means of evaporators and concentrating the resultant vapour into fresh water. It has the economic advantage of utilising excess heat produced by the power-generation boiler and therefore has increasingly been used in large-sized facilities.

It however, requires large energy consumption and, what is worse, extracts inorganic substances from seawater, which adhere to the desalination plant, particularly to surfaces inside the pipes and consequently reduce the heat conductivity of the pipes. Ingredients of the scale include calcium carbonate, magnesium hydroxide and calcium sulphate. It is usually necessary to remove the scale that has adhered by completely cleaning the pipes with acid once every twelve to 18 months.

The new agent (trade name: Aquakreen KC-550), if added to seawater at 2-5 ppm, inhibits growth of layered crystals (scales) and transform them into spherical shapes. It consequently facilitates elimination of scales and reduces their adhesion to surfaces inside the pipes. As a result, deterioration of heat conductivity can be greatly prevented. In particular, it is significant that the product has made it possible to inhibit adhesion of magnesium hydroxide and calcium sulphate, both of which are usually difficult to remove.

The agent is maleic acid copolymer incorporating surfactants, which serve as hydrophilic groups. The company expects it to command 50% of the world market for scale inhibitors and attain annual sales of ¥5,000 million.

JAPANESE, U.S. FIRMS TIE UP FOR ANISOTROPIC-GRAPHITE BUSINESS

Toyo Carbon Co., Pfizer Inc. (U.S.) and Pfizer MSP — Pfizer's Japanese subsidiary — have concluded a formal agreement on broad co-operation in fine-carbon business.

In accordance with the agreement, Toyo Carbon will serve as general agency in Japan for the U.S. company with regard to anisotropic-graphite operations. Toyo Carbon will import finished products from Pfizer and, in addition, buy raw-material plates from the same company and subject them to thermal treatment. The Japanese company, together with Pfizer MSP, is scheduled to exploit application fields for anisotropic graphite.

Toyo Carbon and Pfizer intend to jointly develop new-type anisotropic graphite and related products and establish in Japan a production company on an equal-ownership basis two or three years hence. They are aiming at applying anisotropic graphite to atomic power plants, nuclear fusion and the manufacture of semiconductors and medical-use products including biomaterials.

Pfizer's anisotropic graphite (trade name: Pyroid) is produced by depositing methane gas within a high-temperature vacuum furnace using a chemical-vapour-deposition process. The product is a lamination of carbon layers, in which a carbon atom is firmly combined with three other atoms. Each layer is loosely connected to the next. Pyroid shows high thermal conductivity in the horizontal direction but transfers hardly any heat in the vertical direction. The heat-transfer ratio between the horizontal and vertical directions stand at 200:1.

The product has only a tiny metal content (below 5ppm) and high capacity for removing gas from targeted material and is so tough that it does not creep at high temperature. Toyo Carbon and Pfizer are the world's largest producers of isotropic and anisotropic graphites, respectively.

ANTISTATIC POLYPROPYLENE FIBER PIONEERED: MITSUBISHI RAYON

Mitsubishi Rayon Co. has developed polypropylene (PP) fiber (trade name: Roval) having an ultrahigh antistatic property and begun to market the new product for use in carpeting. The new type fiber is produced by adding electroconductive material (carbon black) to PP resin and spinning the resultant product. The company has imparted the bulkiness needed for carpeting to the product by means of a mechanical crimping process. The fiber thereby obtained has chemical resistance, colour fastness to light and abrasion resistance. It consists of four 50-denier filaments and has electrical resistance of 10^8 ohm/cm.

When combined with carpeting-use PP fiber in small quantities, the product serves to keep down the voltage of static electricity with which the human body is charged to below 1kV. In cases where the new product is added to target fiber at the ratios of 0.2 and 2.4%, the said voltage stands at 1.2 and 0.3 kV, respectively. It, therefore, facilitates production of antistatic carpeting usable, for example, for computer rooms.

A few major Japanese carpeting makers have employed the product for office-use carpeting. When a man walks on carpeting, friction between his slippers or shoes and the carpeting itself produces static electricity and he is charged with the electricity thereby generated. When the voltage concerned exceeds 3kV, he occasionally receives an electrostatic shock, induces errors in computers and damages floppy disks. There is a move toward limiting the voltage of static electricity — with which people are charged through contact with carpeting in computer rooms — below 1kV. Bulked continuous filament nylon commands the major part of the domestic market for carpeting materials but the company intends to thrust deeply thereto using the new product, which is expected to exploit non-apparel application fields for synthetic fiber.

DRUG FIRM LINKS WITH INK MAKER FOR ANTIKIDNEY-DISEASE AGENT

Yamanouchi Pharmaceutical Co. has reached an agreement with Dainippon Ink & Chemicals Inc., (DIC), a leading Japanese ink maker, with regard to joint clinical development of DIC's agent effective against kidney diseases. Yamanouchi will commence clinical tests on the agent within the first half of next year and then, on another type of antikidney-disease agent it has developed its own. DIC's agent is said to have good effects for a wide range of diseases caused by kidney trouble and some other organs such as nephritis and pyelitis. As it also has few side effects it is expected to be used for chronic kidney diseases. Yamanouchi's agent likely to appear thereafter is said to be effective against acute or severe kidney diseases.

Kidney diseases have been increasing in Japan and the West and this trend is expected to continue in future. With two types of agents, Yamanouchi believes it will be able to secure a footing in the world market for antikidney-disease drugs. Along with this, the company will put into clinical testing its new type-TPA (tissue plasminogen activator), called 2nd-generation TPA, which has been obtained by modifying a part of the amino acid sequence of existing TPA to prolong its activity as an antithrombosis agent.

BORIDE-APPLIED CERMET FOR CASTING MOLDS BARED BY ASAHI GLASS

Asahi Glass Co. has developed
"UD-II" cermet having strong c
sion resistance and a high lev
strength at high temperature. The c
pany — together with a domestic
casting maker — has successfully e
lished a precision casting method
the new product as material for m
for pressure casting.

The new type cermet is endowed
the rigidity and high temperature
bility of ceramics and the toughness
reliability of metal. Asahi Glass m
to expand application of the produ
heat-resistant structural materials
material for molds for casting alu
ium and copper in particular. The c
pany has a 500-kg/m pilot pla
Yokohama. It has plans to build a
t/m plant next year and attain re
annual sales of ¥1,000 million in f
1991.

UD-II cermet is produced
molybdenum boride compound (c
position ratio, 1:1) and nickel, bo
which are heated and sintered at a
perature of between 1,300 and 1,50
It is "wet" when in contact with m
metal and has a satisfactory degre
toughness. Boride-based cermet no
use is a fragile compound lacking "
tability".

Cermet is composite material con
ing of ceramics (main component)
metal: it has properties intermed
between those of ceramics and me
Conventional type products incorp
carbide material as ceramic compo
and need to be improved in their
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UD-II cermet maintains a high
strength (200kg/mm^2) within a tem
ature range of between room tem
ture and 800°C, attains at
temperature high-level strength
tenacity equivalent to those of h
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strong corrosion/abrasion resis
when brought into contact with alu
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KET INFORMATION

Markets Dull

d dull with prices maintaining their cept for rangolite corded a sharp Rs. 90 + ST and titanium dioxide anatase cheaper by Rs. 5 at Rs. 80 + ST offtake was poor. Solvents were steady & easy availability of intermediates ensured good supply to dyes exporters.

We cannot guarantee the accuracy of the prices published in CHEMICAL WEEKLY as they are based only on the enquiries made by our correspondent – and, as such they are not FIRM PRICES as between a buyer and seller. The prices are published only with a view to giving some ideas of the market conditions.

The prices are inclusive of Excise and Maharashtra Sales Tax.

(Prices as on December 26, 1989)

CALS	Per Kg.
	2.50
e (Mono)	14.50
e (Di)	14.00
(Di)	17.00
de	5.60
	4.00
	6.00
	22.00
	70.00
	6.00
% Cl	4.20

Borax (Granular)	20.00
Borax (Powder)	22.00
Boric acid (Tech)	26.00
Bisphenol-A	70.00
Butyl carbitol	110.00
Caustic soda (Flakes)	13.00
Caustic soda (Solid)	12.00
Caustic soda (Lye)	10.00
Calcium chloride 70% (Solid)	3.25
Calcium chloride 75-80%(fused)	3.50
Calcium chloride 36% (Anhydrous)	5.00
Calcium carbonate (precipitated)	4.25
Calcium carbonate (Activated)	4.75

Cobalt oxide	300.00
Cresylic acid	82.00
Camphor (Indian)	105.00
Cream of Tartar (Tech.) China	70.00
Citric acid (Belgium) (Resale)	47.50
Citric acid (Indian) (Resale)	47.50
Copper sulphate	25.00
Chromic acid	63.00
Ethylene urea	58.00
Ferric chloride (Lumps)	5.50
Ferric chloride (Anhydrous)	16.00
Glue flakes	15.00
Glue sheets	6.75
Gohsenol GH-17	110.00
Hydro	44+ST

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s: 240415/243979/2873680
011-6053 SATC-IN

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Ahmedabad-380 014
Phone: 462332/440084

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Hexamine (Resale)	58.00
Industrial Wax	25.00
Litharge	40.00
Lead Acetate (Tech.)	31.25
Lithopone	20.00
Magnesium chloride (Crystal)	3.00
Menthol crystal (Flakes)	900+Ex+ST
Menthol bold	665+Ex+ST
Menthol crystal bold	700+Ex+ST
Magnesium carbonate (Japan)	16.00
Magnesium carbonate (Indian)	18.00
Maleic Anhydride (Resale)	40.00
Mercury (34.5 Kgs)	10,500.00
Nickel chloride	110.00
Oxalic acid (Resale)	16.00
Peppermint oil (Rectified)	196+Ex+ST
Potassium carbonate (Indian)	34.00
Potassium carbonate (imported)	33.00
Potassium bichromate	32.50+ST
Potassium phosphate (Mono)	14.00
Potassium phosphate (Di)	14.00
Polyvinyl alcohol (No. 117)	115.00
Polyvinyl alcohol (No. 173)	120.00
Polyvinyl alcohol (No. 208)	150.00
Paraformaldehyde (Resale)	23.00
Phthalic anhydride 36% (Resale)	24.25
Pentaerythritol (Resale)	45.00
Paraffin wax	19+ST
Rangolite (German)	90+ST
Rangolite (Czech.)	78+ST
Sodium sulphate (Fine)	6.00
Sodium sulphate (Coarse)	5.00
Sodium sulphide 50-52% (Flakes)	11+ST
Sodium sulphide 58-60% (Flakes) (TCL)	20.00
Sodium sulphide pure (Flakes)	12.25
Sodium nitrite (Resale) per 50 kg	730.00
Sodium chlorite 80% (Spain)	85.00
Soda Ash (Tata)	4.80
Soda Ash (Birla)	4.50
Soda Ash (Imp.)	4.50
Sodium bicarbonate	7.50
Sodium bisulphite	4.50
Sodium silicate	3.00
Sodium acetate	5.00
Sodium alginate	320.00
Titanium Dioxide (Anatase)	80+ST
Titanium Dioxide (Rutile – RCR$_2$)	112+ST
Tartaric acid	100.00
Trisodium phosphate	5.50
Thiourea	86.00
Urea (Tech.)	2.90
Vacuum salt	1.00
Zinc Dust	32.00
Zinc Oxide	58.00
Zinc chloride powder (Tech.)	12.50
Zinc sulphate	7.00

SOLVENTS	Per Kg.
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Acetic Anhydride (Resale)	35.00
Acetone (Resale)	22.00
Adipic Acid	70.00
Aceto Acetanilide	55.00
Aniline Oil	50.00
Benzoate Plasticiser	62.00
Butyl acrylate	89+ST
Butyl stearate	45.00
Butanol	
Benzyl Alcohol	
Benzyl Chloride	
Benzo trichloride	
Benzoyl chloride	
Bromine Liquid	
Chloroform	
Carbon Tetrachloride	
Cellosolve	
Cyclohexanone	
Cyclohexanol	
Diacetone (Resale)	
Diethyl Oxalate	
Diethyl glycol (DEG)	
Dioctyl Phthalate	
Diallyl Phthalate	
Dimethyl Phthalate	
Dioctyl Adipate	
Dibutyl Adipate	
Dipentene	
Dimethylamine 40%	
Dimethylamine 50%	
Ethyl Acetate	
Ethyl Acrylate	
Ethylene Dichloride	
Ethylene Glycol	
Formic Acid (Imp.)	
Formaldehyde (Resale)	
Glycerine (CP)	
Glycerine (IW)	
Hydrogen Peroxide 50% (Res	
Isopropyl Alcohol	
Isobutyl Alcohol (Resale)	
Monoethanolamine (Resale)	
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Polyethylene Glycol (No.500)	52.00
Polyethylene Glycol (No.1600)	54.00
Polyethylene Glycol (No.4000)	70.00
Polyethylene Glycol (No.6000)	85.00
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Styrene Monomer	37+ST
Sorbitol	14.00
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N-Hexane	13.00
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Solvent Naphtha Light	8.50
Toluene	13.50
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N-Methyl Aniline	12
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Ortho Anisidine (OA) (Imp.)	108
Ortho Dichloro Benzene (ODCB)	16
OT Base	130
Para Dichloro Benzene (PDCB)	32
Para Anisidine (PA local)	152
PNA	118
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PNCB	60
Para Amino Acetanilide	190
1-Phenyl 3-Methyl 5-Pyrazolone	155
Phenyl J. Acid	350
Para Amino Benzoic Acid	135
PT Base	155
Rhoduline Acid	550
Resist Salt 80%	28
Resorcinol	210
Sodium Naphthionate	67
5-Sulpho-Anthranilic Acid	82
Sulphanilic Acid	41.0
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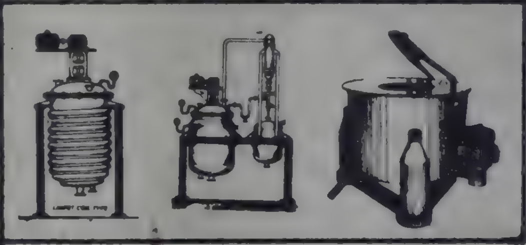

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Bombay Dyes Market

(Prices as on December 26, 1989)

ACID COLOURS	Per Kg.
Acid Violet 4BS	*190.00
Acid Maroon V	110.00
Acid Orange II	112.55
Acid Orange [illegible]	93.80
Acid Red A	157.00
Acid Scarlet 2R	128.35
Acid Red 3BN	*192.60
Acid Red RGR	132.00
Acid Red RS	88.50
Acid Patent Blue AS	*280.00
Acid Green V	*275.00
Acid Coomassie Blue	300.00
Acid Yellow [illegible]	48.00
Acid Red FG	60.00
Acid Red [illegible]	78.00
Acid Black 10 BX	157.15
Acid Black EX	128.00
Acid Black Wax	126.50
Chrome Scarlet [illegible]	280.30
Procion Yellow [illegible]	[illegible]
Procion Red [illegible]	[illegible]
Procion Blue [illegible]	[illegible]
Procion Scarlet [illegible]	[illegible]
Procion Orange [illegible]	[illegible]
Procion [illegible]	[illegible]

* [illegible]

DIRECT COLOURS	Per Kg.
Yellow [illegible]	[illegible]
Sun Yellow [illegible]	[illegible]
[illegible] Yellow [illegible]	[illegible]
Yellow [illegible] Hy. Conc.	[illegible]
Fast Yellow [illegible]	[illegible]
Fast Yellow [illegible]	[illegible]
[illegible] Orange R	[illegible]
[illegible] Orange [illegible]	[illegible]
[illegible]	[illegible]
[illegible] Tan	[illegible]
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[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
Brill. Fast Helio 2R	385.85
Brill. Fast Helio 2RS	177.30
Brill. Fast Helio 6S	116.10
Brill. Violet Extra	181.45
Blue 2B	102.50
Blue G	230.45
Sky Blue FB	242.00
Copper Blue GR	190.25
Fast Greenish Blue GL	114.60
Developed Black BT	149.65
Blue NS-2B	348.45
Blue NS-2BG	214.70
Developed Black NS-GHB	214.70
Green B	140.75
Green NS-B	218.90
Green 2B-N	216.90
Brown MR	197.40
Brown CN	157.00
Golden Brown G	175.85
Catechin G	158.70
Orange Tan	161.45
Caserthin GS	102.80
Black E Hy. Conc.	180.15
Black E Extra Hy. Conc.	180.15
Black NS-EP Hy. Conc.	290.50

DISPERSOL COLOURS	Per Kg.
Red B 3B Conc.	611.50
Red B 2B Conc.	797.80
Red CB Powder	1048.25
Red [illegible] Powder	599.95
Violet [illegible] Conc.	1052.75
Blue [illegible] Conc.	585.45
Blue [illegible] Powder	129.25
Blue [illegible] Powder	[illegible]
Navy [illegible] Conc.	[illegible]
Blue [illegible] Conc.	[illegible]
Brown [illegible] Conc.	376.50
Blue [illegible]	480.40
Yellow [illegible]	413.00
Yellow [illegible]	[illegible]
Yellow [illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

Red 2B
Red FB
Red Violet FBL
Orange 3R
Violet 3R
Violet RL
Violet 6R
Scarlet RR
Rubine 3B
Rubine CB
Blue GL
Blue BGF
Navy Blue RE
Brown 3REL
Black GEL
Dark Brown 3B

BASE COLO
Fast Yellow G
Fast Orange G
Fast Scarlet R
Fast Scarlet R
Fast Scarlet R
Fast Scarlet [illegible]
Fast Scarlet [illegible]
Fast Scarlet [illegible]
Fast Scarlet [illegible]
Fast Red B
Fast Red RC
Fast Red B
Fast Red TR
Fast Red [illegible]
Fast Red RL
Fast Red KB
Fast Bordeaux
Fast Garnet
Fast Violet B
Fast Blue RR

NAPHTHOL

3[illegible] 60
336.05
314.00
349.95
[illegible] 31
[illegible] 45
141.00
514.65
403.00
Per Kg
257.00
143.65
190.55
116.75
176.05
222.90
179.40
187.65
281.10
398.10
414.10
303.80
157.95
313.15
213.55
246.20
179.60
240.45
92.00
[illegible]
119.35
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]

Blue H-PRD	305.60
Navy Blue H3R	330.75
Blue H 5RX	256.20
Navy Blue M3R	355.70
Brill. Blue MR	405.60
Brill. Blue M RX	214.20
Brill. Blue M-G	226.45
Blue M 4GD	389.40
Navy Blue M RB	341.60
Turquoise M-G	240.90
Brill. Blue M GX	616.20
Blue 3R Aura Powder	718.20
Dark Brown H 8R	248.45
[illegible] Conc.	[illegible]
Green H4BD	[illegible]
Green H-G4B	[illegible]
Red Brown H R	143.25
Orange Brown H 3R	[illegible]
Brown M 5RN	[illegible]
Black H-N	[illegible]

SULPHUR COLOURS	Per Kg
Navy Blue	210.35
Green G	194.55
Black Grains Extra	72.25
Black Grains OG	73.78
Black [illegible] Conc.	[illegible]
Black [illegible]	[illegible]
Black [illegible]	[illegible]
Black Grains 800	62.30
Black BRR Grains	[illegible]
Black EXR Grains 300	59.35

VAT COLOURS (SD)	Per Kg
Yellow 5G Supra Disperse	[illegible]
Yellow [illegible] Aura Conc.	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

Brill. Purple 2R Hly. Conc.	[illegible]
Brill. Purple 4R Supra Disp.	[illegible]
Brill. Purple 2R Aura Conc.	[illegible]
Blue 2R Powder Fine	[illegible]
Blue BC Aura Con. Pdr. Fine	[illegible]
Blue BC Conc. Pdr. Fine	[illegible]
Blue R Conc. Pdr. Fine	[illegible]
Blue Conc. Powder	[illegible]
Brill. Blue 2R Hly. Conc.	[illegible]
Blue RR Supra Powder	[illegible]
Brill. Blue 2R Supra Disp.	[illegible]
Dark Blue 2R Powder Fine	[illegible]
Blue BC Supra Disp.	[illegible]
Jade Green XBN Powder Fine	[illegible]
Jade Green XBN Aura	
Conc. Pdr.	[illegible]
Jade Green 2G Pdr. Fine	[illegible]
Jade Green 2G Pig. Paste	[illegible]
Jade Green XBN Pig. Paste	[illegible]
Jade Green 2G Supra Disp.	[illegible]
Olive B Pdr. Fine	[illegible]
Olive Green B Supra Disp.	[illegible]
Jade Green XBN Supra Disp. (N)	[illegible]
Olive DMR Powder Fine	[illegible]
Olive OMW Supra Disp.	536.25
Olive D Supra Disp.	[illegible]
Olive R Supra Disp.	470.25
Olive D Pig. Paste	[illegible]
Olive Green B Pig. Paste	[illegible]
Olive Green B Aura Conc.	[illegible]
Olive R Aura Conc.	[illegible]
Brown R Pdr. Fine	[illegible]
Dark Brown 3R Fine	[illegible]
Brown G Supra Disp.	[illegible]
Brown 3G Supra Disp.	[illegible]
Brown R Supra Disp.	[illegible]
Brown BR Powder	[illegible]
Dark Brown 3R Pig. Paste	[illegible]
Dark Brown 3R Supra Disp.	[illegible]
Brown G Aura Conc.	[illegible]
Brown M Powder Fine	[illegible]
Grey M Supra Disp.	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

Delhi Market

DELHI: DEC. 22, (NNS) Tartaric acid France fell sharply by Rs. 400 at Rs. 13,800 per 50 kg in the Delhi chemicals market during the week under review, on account of increased import from France as well as fall in demand from paneer manufacturers, says NNS. Tartaric acid Trishul marka came down by Rs. 50 at Rs. 4,150 (per 15 kg) in view of comfortable stock position. Offtake was also poor in citric acid at Rs. 2,150/2,375 (per 50 kg).

Borax granular and crystal came down by Rs. 15 at Rs. 835 each per 50 kg owing to poor demand by local and outside traders. As a result of poor enquiries, boric acid technical slipped by Rs. 50 at Rs. 1,400. Caustic soda flakes moved down by Rs. 5 at Rs. 505 because of poor export demand.

Rangolite Germany tumbled down by Rs. 3 at Rs. 67 per kg following increased import and negligible demand from textile units. Sufolite was being offered lower at Rs. 78 against Rs. 82 and chatkolite decreased by Re. 1 at Rs 66. Inspite of good demand from gur and khandsari makers, sodium hydrosulphite, Damosha and Tamil Nadu softened by 50 paise at Rs. 36 each per kg. Hydro Kalali and Gulshan ruled quiet at Rs. 36.50 and Rs. 34 per kg. Following restricted demand from plastic and paint units and increased offerings between stockists and distributors induced by stringent money condition. Titanium dioxide anatase, RC-822 and RCR-2 eased by Rs. 1/2 at Rs. 83 and Rs. 98 each per kg. K brand of Calcutta side ruled quiet at Rs. 76 per kg.

Stable bleaching powder KCI suffered a fall of Rs. 5 at Rs. 90 per 25 kg due to poor enquiries while Modi sold higher at Rs. 92 against Rs. 90 in view of tight stock position. Soda bicarb slipped by Rs. 2/3 at Rs. 290/295 due to poor offtake. Sodium nitrite went up by Rs. 50 at Rs. 800/900 owing to tight stock position. In the wake of poor arrivals from Sambhal, Muradabad, Rampur, Amroha, and Chandousi areas of U.P. as well as sustained export demand, menthol bold, flake and medium hardened by Rs. 10/15 at Rs. 370, Rs. 360 and Rs. 330 per kg. Mentha oil rose by Rs. 10 at Rs. 245/265 and DMO traded higher at Rs. 120 against Rs. 110 per kg. As a result of higher advices from Bombay, mercury held steady at Rs. 10,700 per flask. No variation was noticed in dyes and colours.

(DELHI MARKET RATES AS ON DECEMBER 22, 1989)

Ammonia Bicarb (Per 25 Kg.)	140.00
Mercury (Per flask)	10,700.00
Soda ash (Per bag)	343/350.00
Ammonium Chloride (50 Kg.)	110/180.00
Caustic soda flakes (50 Kg.)	505.00
Citric acid (Per 50 Kg.)	2,150/2,375.00
Stable Bleaching Powder Shriram (Per 25 Kg.)	100.00
Stable Bleaching Powder KCI (Per 25 Kg.)	90.00
Stable Bleaching Powder Modi (Per 25 Kg.)	[illegible]
Stable Bleaching Powder [illegible] (Per 25 Kg.)	[illegible]
Sodium Bicarbonate (50 Kg.)	290/295.00
Sodium Hydrosulphite (Per Kg.)	34.00/36.50
Rangolite (Per Kg.)	67.00/67.00
Boric acid Technical (Per 50 Kg.)	1,400.00
Paraffin Wax (Per 50 Kg.)	850.00
Tartaric Acid (Trishul Per 15 Kg.)	4,150.00
Borax Granular (Per 50 Kg.)	835.00
Borax Crystal (Per 50 Kg.)	835.00
Sodium Nitrite (Per 50 Kg.)	800/900.00
Sodium Nitrate (Per 50 Kg.)	450.00
Camphor [illegible] (Per Kg.)	103.00
Camphor Powder (Per Kg.)	[illegible]
Menthol Bold (Per Kg.)	[illegible]
Menthol Medium (Per Kg.)	[illegible]

Menthol Flake (Per Kg
Glycerine (Per Kg.)
Sodium Silicate (Per qu
Hexamine (Per Kg.)
Acetic Acid Glacial (Per
Copper Sulphate
(Per quintal)
Formic Acid (Per Kg.)
Formaldehyde (Per Kg.)
Hydrogen Peroxide (Per
Calcium Carbonate
(Per Tonne)
Acid Slurry Soft (Per Kg
Acid Slurry Hard (Per K
Phosphoric Acid (Per 5
Potassium Nitrate
(Per quintal)
Potassium Permangana
(Per 50 Kg.)
Sodium Bichromate
(Per 50 Kg.)
Trisodium Phosphate (5
Titanium Dioxide Anata
Titanium Dioxide RC-82
Titanium Dioxide K-Bra
Titanium Dioxide RCR-
Zinc Oxide
(Per metric tonne)
Phenol Carbolic Acid (P
Carbon Tetrachloride (
Chloroform (Per Kg.)
Sodium Sulphate
(Per metric tonne)
Naphthalene Balls (Per

DYES & COLOURS

Naphthol AS
Naphthol ASG
Naphthol ASBS
Naphthol ASTR
Naphthol ASOL
Naphthol ASBO

DIRECT DYES

Black E Conc
Diazo Black B T
Green B
Blue 2-B
Blue 2-B 225% (JNR
Sky Blue FB
Basic Auramine
Basic Rhodamine
Basic Methylene Blue
Basic Violet
Basic Malachite Green
Acid Orange
[illegible]

Madras Market

ed a fall in
lide in prices
nued in spite
power cut in
nium dioxide
5 per kg on
o there has
nces of oxalic
wn to Rs. 20
availability.

Some new manufacturers have also come in the field. Similarly soda ash prices also came down on pressure selling. M/s. J.B.F. Synthetic's new plant for manufacture of trichloroethylene has gone on stream and the materials have started coming out. Reports about the quality and acceptance by consumers are eagerly awaited.

RKET RATES AS ON DECEMBER 23, 1989)

ST)	16.00	Calcium Carbonate (Precipitated)	
ree		(per MT)	5,000.00
	4,000.00	Citric Acid (per kg)	48.00
		Copper Sulphate (per kg)	25.00
	140.00	Cresylic Acid 98-99% (per kg)	130.00
MT)	2,800.00	Pure Para Cresol 98% (per kg)	85.00
	31.00	Meta Para Cresol 42% (per kg)	50.00
g)	9.00	Formic Acid (per kg)	24.00
	8.00	Formaldehyde (per kg)	8.00
kg)	26.00	Glue Flakes (per kg)	15.00
kgs)	220.00	Glycerine I.W. (per kg)	50.00
	900.00	Hydrosulphite of Soda	
ntur		(TCPL) (per kg)	38.00
	10,800.00	Hydrosulphite of Soda (IDI) (per kg)	42.00
ndhra		Hydrosulphite of Soda	
	10,800.00	(BASF) (per kg)	42.00
olid		Hexamine (per kg)	30.00
	3,000.00	Hyflosupercell (per kg)	21.00
ra		Hydrogen Peroxide (per kg)	32.00
	5,750.00	Litharge (per kg)	40.00
[illegible]		Lead Acetate (per kg)	40.00
	6,000.00	Magnesium Carbonate (per kg)	[illegible]

Magnesium Chloride (per kg)	3.50
Maleic Anhydride (per kg)	40.00
Menthol Crystals (per kg)	280.00
Oxalic Acid (per kg)	20.00
Paraffin Wax (per kg)	18.00
Potassium Bichromate (per kg)	36.00
Phosphoric Acid (per kg)	25.00
Polyvinyl Alcohol Powder (per kg)	130.00
Pentaerythritol (per kg)	50.00
Phthalic Anhydride (per kg)	30.00
Soda Ash (TAC) (per 75 kgs)	250.00
Soda Ash (TATA) (per 75 kgs)	250.00
Sodium Bicarbonate (TATA) (per 50 kgs)	260.00
Sodium Silicate (per MT)	3,250.00
Sodium Bichromate (per kg)	28.00
Sodium Nitrate (per kg)	8.00
Sodium Nitrite (per kg)	15.00
Sodium Sulphide Flakes (per kg)	14.00
Sodium Bisulphite (per kg)	4.50
Sodium Alginate (per kg)	225.00
Sodium Acetate (per kg)	7.00
Sodium Sulphate (Anhydrous) (per kg)	3.00
Titanium Dioxide (Anatase) (per kg)	75.00
Titanium Dioxide (Rutile) (per kg)	85.00
Trisodium Phosphate (per kg)	7.00
Urea (Technical) (per kg)	3.00
Zinc Oxide (per kg)	50.00
Zinc Chloride Powder (per kg)	12.00
Zinc Sulphate (per kg)	7.00

SOLVENTS

Acetone – HOCL (per kg)	22.00
Butanol (per kg)	36.00
Butyl Acetate (per kg)	42.00
Benzene (per lit)	14.00
Cellosolve (per kg)	50.00
Carbon Tetra Chloride (per kg)	24.00
Chloroform (per kg)	29.00
Diacetone Alcohol (per kg)	30.00
Diethylene Glycol (per kg)	42.00
Dichloroethane (per kg)	18.00
Di-octyl Phthalate (per kg)	46.00
Di-N-butyl Phthalate (per kg)	48.00
Ethyl Acetate (per kg)	23.00
Isopropyl Alcohol (per kg)	30.00
Methanol (per kg)	10.00
Methylene Chloride (per kg)	23.00
Methyl Ethyl Ketone (per kg)	34.00
Methyl Isobutyl Ketone (per kg)	42.00
Phenol (per kg)	38.00
Sorbitol (per kg)	15.00
Triethanolamine (per kg)	54.00
Trichloroethylene (per kg)	25.00
1-1-1 Trichloroethane (per kg)	25.00
Turpentine (per lit)	16.50
Toluene (per lit)	[illegible]
Xylene (per lit)	[illegible]

Shipping News

VESSELS DUE IN BOMBAY FOR EXPORT LOADING

Due Date (1)	Steamer's Name & Flag (2)	Agents (3)	Will load for (4)	Appr sailing (5
28/12	Dorothee	Samrat/ Hindustan/ Merzario	Felixstowe; Hamburg; Rotterdam also London; Liverpool; Leixoes; Lisbon; Manchester; Avonmouth; Wembly; Birmingham; Leicester; Le Havre; Amsterdam; Bremen; Antwerp; Copenhagen; Leeds; Aarhus; Gothenburg; Oslo; Stockholm; Helsinki; Belfast & all destination in U.K.; Benelus; Germany; Italy; France; Switzerland & Austria. (Carting at M.O.D. No. 2 for Merzario). (Carting at M.O.D. No. 1 for Samrat & Hindustan).	5/1
28/12	Tilia	U.L.A.	P. Sudan; Aden; Djibouti; Hodeidah. (Carting at 14-VD for containers).	5/1
29/12	Mette Sif (Dan) (V-801)	Marine Trans/	Antwerp; Rotterdam; Hamburg; Bremen; Le Havre; Felixstowe; Hull; Rostock; London; Liverpool; Avonmouth; Copenhagen; Gothenburg; Aarhus; Oslo; Stockholm; Helsinki; Malmao; Norkopping; Helsingburg; (Including inland destinations for above ports). Lattakia; Limmasol; Izmir; Mersin; Istanbul; Beirut; Marseilles; Valencia; P. Sai; Casablanca; Alexandria; Piraeus; Solonki; Iraqi ports. (Carting at T.P. No. 3).	3/1
		Khemka/	Larnaca; Mersin; Izmir; Casablanca; Genoa; Lattakia; Alexandria; Istanbul; Las Palmas & Teneriffe; Antwerp; Rotterdam; Hamburg; Bremen; Gdansk; Le Havre; Copenhagen; Gothenburg; Aarhus; Oslo; Stockholm; Malmao; Helsingburg; Helsinki; Kotka. (Carting at Wadi Bunder No. 3).	
		M.C.S./	Jeddah; Genoa; Felixstowe; Hamburg; Rotterdam; Antwerp; Le Havre; Gdynia; Lisbon; Aarhus; Copenhagen; Gothenburg; Oslo. (Carting at H.B. No. 4).	
		Ranadip	Jeddah; Palermo; Naples; Livorno; (Leghorn) Marseilles (Fos); Genoa; Barcelona; Bilbao; Valencia; Alicante; Algiers; Lisbon; Leixoes; Bremerhaven; Le Havre; Antwerp; Rotterdam; Bremen; Hamburg; Aarhus; Pireus; Gothenburg; Oslo; Copenhagen; Stockholm; Helsinki; Felixstowe; Tilbury; London; Avonmouth; Dublin; Belfast; Grangemouth; Liverpool; Manchester. (Carting at M.O.D. No. 3).	
29/12	Seacrest Achiever (Ger) (V-204)	Merzario/	Jeddah; Hodeidah; P. Sudan; Ravenna; Ancona; Piraeus; Venice; Trieste. (Carting at M.O.D No. 2).	6/1
		Seaspeed/	Tilbury; London; Felixstowe; Manchester; Liverpool; Avonmouth; Le Havre; Rotterdam; Hamburg; Antwerp; Bremerhaven and Scandinavian ports. (Carting at Hay Bunder No. 3).	
		L. Triest/	Jeddah; Trieste; Venice; Ravenna; Rijeka; Naples. (Carting M-171/173 C.D.)	
		Oceanic/	P. Said; Limassol; Alexandria; Casablanca; Tripoli; Livorno; Genoa; Mersin; Iskendren; Izmir. (Carting at Wadi Bunder No. 3).	
		Killick	Jeddah; Felixstowe; London; Liverpool; Manchester; Bristol; Avonmouth; Leeds; Glasgow; Tilbury; Birmingham; Dublin; Belfast; Rotterdam; Hamburg; Le Havre; Antwerp; Bremen; Bremerhaven; Fos; Valencia; Marseilles; Barcelona. (Carting at M-178/180 cotton depot).	
2/1	Integra	P & O/	Assab; Djibouti; P. Sudan. (Carting at Timber Pond No. 4).	
		Arebee	Alexandria; Piraeus; Venice; Trieste; Koper; Naples; Fos; Barcelona; Valencia; Livorno; Las Palmas; Limmasol. Constanza Budapest. (Carting M-Jetha C.D.).	6/1
4/1	Lanka Abhaya	Seahorse	Hodeidah; Jeddah; Aqaba; Alexandria (Direct); Felixstowe; London; Liverpool; Manchester; Avonmouth; Dublin; Glasgow; Wembly; Liecester; Immingham; Birmingham; Leeds; Antwerp; Bremen; Copenhagen; Gothenburg; Hamburg; Rotterdam; Oslo; Stockholm; Helsinki; Aarhus; Malmao, Norkopping. (Carting at M.O.D. No. 3).	8/1
6/1	Archimedes (Nhava Sheva)	[illegible]/ S.W. & Co.	Tilbury; London; Felixstowe; Avonmouth; Manchester; Liverpool; Glasgow; Leeds; Birmingham; Dublin; Belfast; Bristol; Marseilles;	6/1

(2)	(3)	(4)	(5)
	Trident/ P & O	Genoa; Barcelona; Le Havre; Antwerp; Rotterdam; Hamburg; Bremerhaven; Copenhagen; Oslo; Helsinki; Malmao; Gothenburg; Stockholm; Aarhus; Alborg. (Carting at Kalamboli for all).	
Abhaya	Seahorse	Colombo. (Carting at M.O.D. No. 3).	8/1
ipura (Ind)	S.C.I.	Main Japan ports.	4/1
Sif	Marine Trans/	Singapore; Hong Kong; Busan; Kobe; Tokyo; Djakarta. (Carting at T.P. No. 3).	3/1
	M.C.S/	Far East & Japan ports. (Carting at H.B. No. 4).	
	Ranadip/	Far East & Japan ports. (Carting at M.O.D. No. 3 for Ranadip).	
	Khemka	Singapore; Hong Kong; Busan; Tokyo; Kobe. (Carting at W.B. No. 3).	
Sincerity 9A/B) (Lib)	O.S.A./	P. Kelang; Singapore; Kaohsiung; Hong Kong; Bangkok; Kobe; Yokohama; Nagoya; Moji; Osaka; Busan; Tokyo; Simizu; Keelung; Tsingtao; Quindao; Xiangang; Shanghai. (Carting M-178/180 C.D. For O.S.A).	7/1
	M.S.P.L.	Singapore; Bangkok; P. Kelang; Penang; Jakarta; Manila. (Carting at Hay Bunder No. 4).	
Abhaya	Seahorse	Singapore; Penang; P. Kelang; Bangkok; Hong Kong; Keelung; Kobe; Yokohama & FCL only Busan; Inchon; Osaka; Tokyo; Nagoya; Kaohsiung. (Carting at M.O.D. No. 3).	8/1
Sif	M.C.S.	Sydney; Melbourne; Brisbane; Burnie; New Castle. (Carting H.B. No. 4).	3/1
Sincerity	O.S.A.	Sydney; Melbourne; Adelaide; Brisbane; Fremantle; Auckland; Wellington; Lyttleton; P. Chalmers. (Carting at M-178/180 cotton depot).	7/1
Abhaya	Seahorse	Brisbane; Fremantle; Sydney; Melbourne; Adelaide. (Carting M.O.D. No. 3).	8/1
Sif (V-801)	Ranadip	Dubai; Muscat; Abu Dhabi; Doha; Dammam; Bahrain; Kuwait. (Carting at M.O.D No. 3).	3/1
hansaa	Al Rafidain	Umm Qaser (Iraq).	3/1
(V-62) (Cyp)	U.L.A.	Dubai; Dammam; Kuwait; Bahrain; Riyadh; Abu Dhabi; Doha. (Carting at 14-VD for containers).	5/1
est Achiever er) (V-204)	Parekh/	Muscat; Dubai; Sharjah; Abu Dhabi; Bahrain; Dammam; Kuwait; Baghdad. (Carting at Hay Bunder No. 4).	6/1
	Merzario/	Dubai; Sharjah; Abu Dhabi; Muscat; Doha; Dammam; Kuwait; Bahrain. (Carting at 14-VD for Merzario).	
	L. Triest/	Dubai; Dammam; Riyadh; Muscat; Abu Dhabi; Doha; Kuwait; Bahrain; (Carting at 171/173 cotton depot for L. Triest).	
	Seaspeed	Dubai; Dammam; Bahrain; Kuwait; Doha. (Carting at H.B. No. 5).	
snes (Nor)	I.L.S.A.	Dubai. (Carting at C-PD).	6/1
a Abhaya	Seahorse	Dubai; Khorfakkan; Sharjah; Muscat; Dammam; Riyadh; Kuwait. (Carting at M.O.D. No. 3).	8/1
ra (V-14) (Pan)	Arebee/	Dar Es Salaam & Mombasa (Direct); Kampala; Jinja; Torroro; Lugazi; Entebee (Uganda); Kigali; (Rwanda); Kitwe; Lusaka; Ndola (Zambia); Lilongwe; Blantyre (Malawi); Maputo; Zanzibar. (Carting at M.J.C.D.).	6/1
	P & O	Mombasa; Dar Es Salaam (Direct); Beira; Mahe and inland destinations in East Africa. (Carting at Timber Pond No. 4).	
e Sif oy-801)	Marine Trans/	Boston; New York; Baltimore; Norfolk; Charleston; Port Everglades; Jacksonville; Galveston; Houston; Los Angeles; Toronto; Montreal; Philadelphia; Savannah; New Orleans; South & Central American ports. (Carting at T.P. No. 3).	3/1
	M.C.S./	Savannah; New York; Baltimore; Wilmington; Houston; Galveston; Los Angeles; Longbeach; Boston; Norfolk; Charleston; Jacksonville; Miami; Tempa; New Orleans; Providence; San Diego; Oakland; Sanfrancisco; Stockton; Chicago; Detroit; Cleveland; Milwaulkee; Columbus; Kansas City; Atlanta; Nashville; Dallas; Minneapolis. (Carting at Hay Bunder No. 4).	
	Ranadip	New York; (Elisabeth); Portsmouth (Norfolk); Baltimore; Charleston; Boston; Philadelphia; Houston; New Orleans; Jacksonville; Savannah; Wilmington (N.C.); Mobile; P. Everglades; (Miami); Los Angeles; (Longbeach); Oakland; Portland; Seattle; Anchorage; Montreal; Quebec; Ontario; Toronto via Halifax; Vancouver; Detroit also Caribbean & Mexican ports. (Carting at M.O.D. No. 3).	

(1)	(2)	(3)	(4)	(5
29/12	Seacrest Achiever (Voy-204)	Seaspeed/	New York; Baltimore; Norfolk; Savannah; Charleston; Houston & S. American ports. (Carting at Hay Bunder No. 3).	6/
		Oceanic	New York; Baltimore; Philadelphia; Chicago; Boston; Norfolk; Atlanta; Charleston; Savannah; Miami; Houston & other inland destinations. In U.S.E. Coast & S. American ports. (Carting at Wadi Bunder No. 3).	
2/1	Ocean Sincerity (V-19A/B)	O.S.A.	New York; Baltimore; Philadelphia; Houston; Boston; Chicago; Dallas; Atlanta; Savannah; Norfolk; Charleston; Los Angeles; Sanfrancisco; Oakland; Seattle; Vancouver; Toronto; Montreal; Portland; Tacoma & S. American & W. Indies ports. (Carting M-178/180 cotton depot).	7/
4/1	Lanka Abhaya	Seahorse	New York; Baltimore; Charleston; Norfolk. (Carting at M.O.D. No. 3).	8/
6/1	Archimedes (Nhava Sheva)	Patvolk/ P & O/ S.W. & Co./	S. American ports. (Carting at Kalamboli for all).	8/
		Trident	New York; Norfolk; Savannah; Baltimore; Boston; Charleston; Houston.	
29/12	Seacrest Achiever	Seaspeed	West African ports. (Carting at Hay Bunder No. 5).	6/1
2/1	Integra (V-04)	Arebee	Lagos; Apapa; P. Harcourt; Abidjan; Tema; Takoradi; Monrovia; Lome; Freetown; Cotonou; Douala; Matadi. (Carting M-Jetha C.D.).	6/1
6/1	Archimedes (Nhava Sheva)	Patvolk/ P & O/ S.W. & Co.	West African ports. (Carting at Kalamboli for all).	8/1

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4/1	Lanka Abhaya	Seahorse	U.K. Cont.
5/1	Maribor	Depe	Far East
8/1	Pioneer Zorka	Transocean	F. East/USSR
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d., 19,975 Kgs., Rs. 2,64,653;
di Arabia: S.S. Laminates P.
5 MTs., Rs. 3,32,532; From
e: Jtex Polyproducts, 17 MTs.,
516; Kavitha Plastic Inds., 8.5
. 1,06,525; Nartan Polymer P.
MTs., Rs. 2,23,006; Rabbani
17 MTs., Rs. 2,10,516; Siva-
Polymers, 8.5 MTs.,
,525; S.S. Laminates P. Ltd.,
, Rs. 1,10,844; Vadera Plastics
se, 68 MTs., Rs. 8,91,032.

: From Finland: Gurukar Plas-
, 25 Kgs., Rs. 390; From Sin-
Rabbani Exports, 32 MTs.,
,926; Shri Lakshmi Narayana
17 MTs., Rs. 2,41,841; From
B Mec Batteries Ltd., 33,000
s. 3,68,859.

PROPYLENE: From FRG:
ubber Co. Ltd., 2,000 Kgs.,
,424; From Netherlands: Poly-
Pvt. Ltd., 30,000 Kgs.,
,734; From Singapore: Super
15 MTs., Rs. 1,92,565; From
arasimha Plastic India P. Ltd.,
s., Rs. 5,63,310; Ultramarine
s Ltd., 30 MTs., Rs. 3,75,542.

POLYSTYRENE: From Korea: Integrated Exports, 51 MTs., Rs. 5,58,306; Universal Polychem, 408 MTs., Rs. 44,48,068.

PVC RESIN: From USA: Mercury Plastics, 34,000 Kgs., Rs. 4,33,742.

DRUG MATERIALS IMPORTED MADRAS
(From 10.11.89 to 25.11.89)

AMPICILLIN SODIUM STERILE BP: From Hong Kong: TTK Chemicals Limited, 100 Kgs., Rs. 1,61,503.

ERYTHROMYCIN THIOCYANATE: From USA: Tamil Nadu Dadha Pharmaceuticals Limited, 999.55 Kgs., Rs. 12,34,201.

GRISEOFULVIN BP/USP: From Singapore: American Remedies Private Limited, 250 Kgs., Rs. 1,09,702.

MORPHOLINE: From USA: Standard Organics Limited, 15,060 Kgs., Rs. 5,86,616.

NORFLOXACIN: From Switzerland: Tamil Nadu Dadha Pharmaceuticals Limited, 200 Kgs., Rs. 4,44,455.

PENICILLIN G. POTASSIUM: From USA: Benzek Labs Ltd., 3,295.96 Kgs., Rs. 14,44,974.

PROPANTHELINE BROMIDE BP: From Denmark: Siri Pharma, 100 Kgs., Rs. 1,01,614.

MATERIALS EXPORTED MADRAS
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ALUMINIUM FLUORIDE: To Australia: T.N. Fluorine & Allied Chem Ltd., 12,000 Kgs., Rs. 22,30,550.

ETHAMBUTOL HCL BP 80: To Hamburg: Medchl Chem & Pharm. Pvt. Ltd., 1,000 Kgs., Rs. 4,82,976.

ZINC OXIDE: To USA: MMTC of India Ltd., 20,000 Kgs., Rs. 5,82,879.

MATERIALS IMPORTED MADRAS
(From 26.11.89 to 30.11.89)

ACETONE: From China: Dolphin Drugs Pvt. Ltd., 12.8 MTs., Rs. 1,64,750; Priya Chemicals, 51.2 MTs., Rs. 6,59,000.

ACETONITRILE: From China: IDPL, 12,000 Kgs., Rs. 3,04,841; NOCIL, 12,000 Kgs., Rs. 3,04,842.

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BARBITURIC ACID: From Switzerland: Babros Chemicals Pvt. Ltd., 400 Kgs., Rs. 62,662.

BUTYL ACRYLATE MONOMER: From Hong Kong: Bharat & Co., 7,020 Kgs., Rs. 1,52,011.

PARA CRESOL: From UK: Balmer Lawrie & Co. Ltd., 1 Kg., Rs. 31.

ETHYL ACETO ACETATE: From FRG: TTK Chemicals Ltd., 3,000 Kgs., Rs. 1,06,695.

GAMMA FERRIC OXIDE: From USA: Audio Electronic Co., 4,000 Lbs., Rs. 1,21,937.

ISOBUTYL BENZENE: From USA: Shasun Drugs, 13,657 Kgs., Rs. 7,70,144.

ISOPHTHALIC ACID: From Italy: Chemidye Mfg. Co. Pvt. Ltd., 17,500 Kgs., Rs. 2,77,110.

ISOPROPYL ALCOHOL: From China: Shasun Drugs, 38.4 MTs., Rs. 4,57,479.

LAB CHEMICALS: From USA: Kasturba Medical College, 29 Nos. Rs. 17,211.

LITHOPONE 30%: From FRG: Carborandum Universal Ltd., 10 MTs., Rs. 1,53,126.

MANGANESE OXIDE: From Belgium: Hilversun Electronics, 6 MTs., Rs. 2,98,746.

METHYL ACETO ACETATE: From USA: Siris Ltd., 30.672 MTs., Rs. 7,23,104.

MONOCHLORO ACETIC ACID: From FRG: Priya Chemicals, 33,000 Kgs., Rs. 6,42,707.

ORGANIC CHEMICALS: From Ireland: Nagarjuna Signode Ltd., 25 Nos., Rs. 3,356.

D(-) PARA HYDROXY PHENYL GLYCINE: From Singapore: TTK Chemicals Ltd., 1,000 Kgs., Rs. 3,72,584.

MURIATE OF POTASH: From FRG: Indian Potash Ltd., 1,059 MTs., Rs. 25,50,559.

POTASSIUM PERMANGANATE: From UK: India Pistons Ltd., 16.8 Kgs., Rs. 14,100.

PROPYLENE GLYCOL USP: From Gandhi Flour Mills & Perfumery, 150 Kgs., Rs. 32,637.

SODIUM CHLORIDE: From USA: Kasturba Medical College, 29 Nos., Rs. 17,211.

TETRAHYDROFURAN: From Japan: Glindia Limited, 14,400 K Rs. 6,82,845.

XYLENE MIXED: From Ne lands: Addisons Paints & Chen Ltd., 50.4 MTs., Rs. 4,51,377.

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LDPE: From Singapore; Rabb Exports, 16 MTs., Rs. 1,90,272.

POLYPROPYLENE: From Neth lands: Polyspin Pvt. Ltd., 42 M Rs. 5,21,773; From Singapore: Hin stan Plastics Pvt. Ltd., 16 M Rs. 2,30,325.

POLYSTYRENE: From Korea: P Sons Pvt. Ltd., 12 MTs., Rs. 3,20,

STYRENE MONOMER: Fr FRG: Chemidye Mfg. Co. Pvt. L 17,200 Kgs., Rs. 2,67,989.

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LIC ACID: From Japan: Nerolac, NA, Rs. 2,777; s Nerolac, 1,600 Kgs., 40; From UAE: Vipul Dyes & ls, 195 Kgs., Rs. 5,044.

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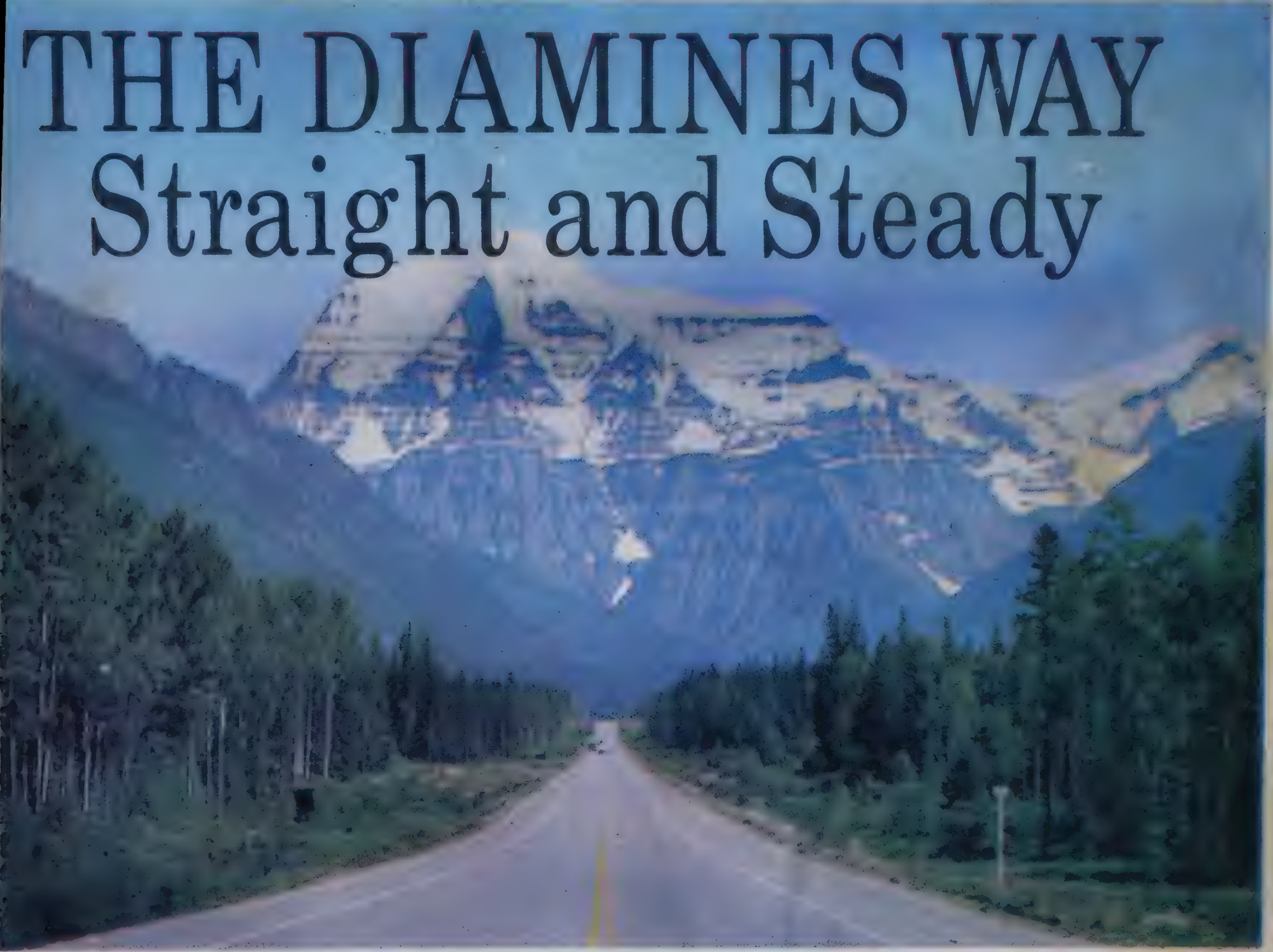

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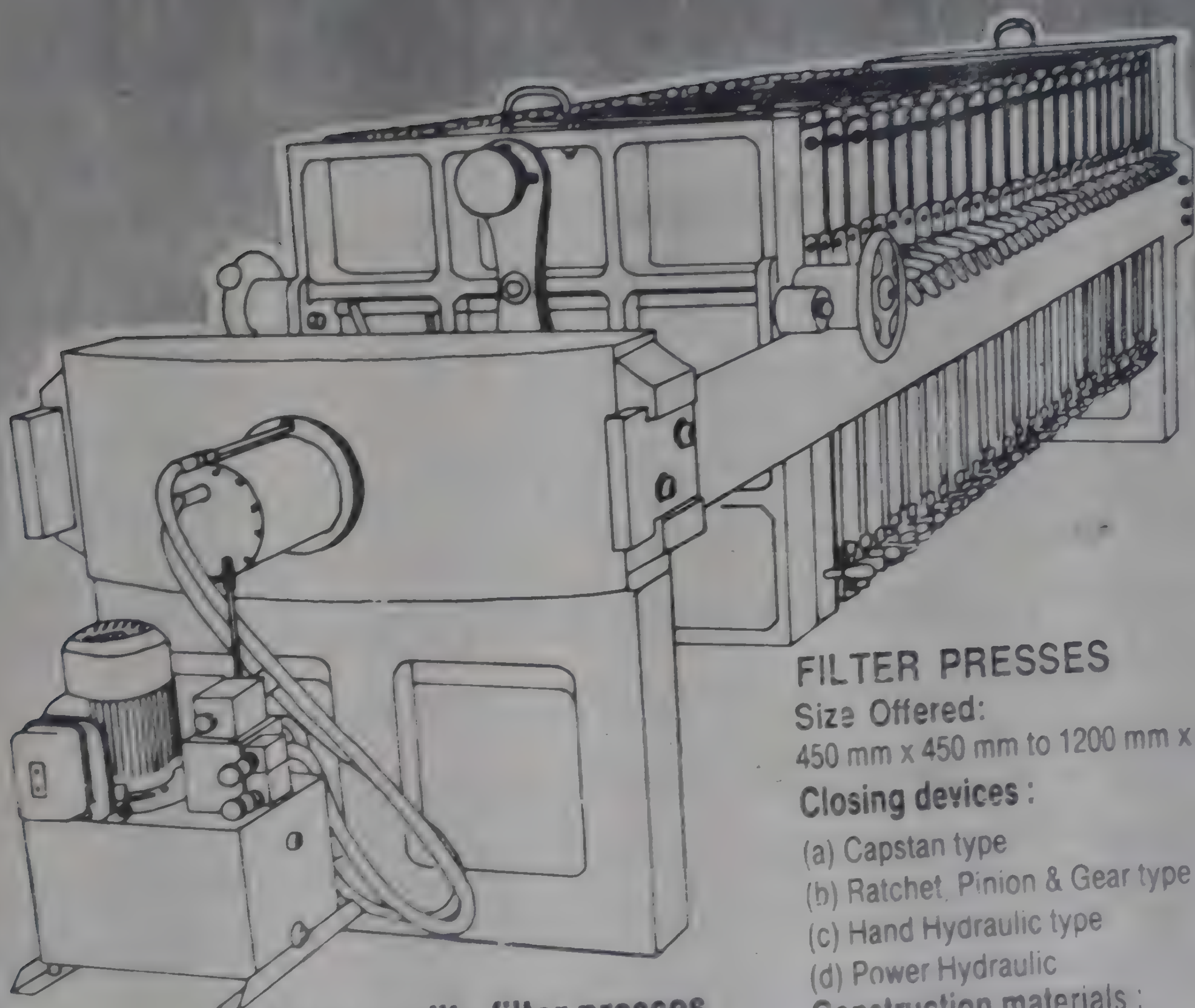

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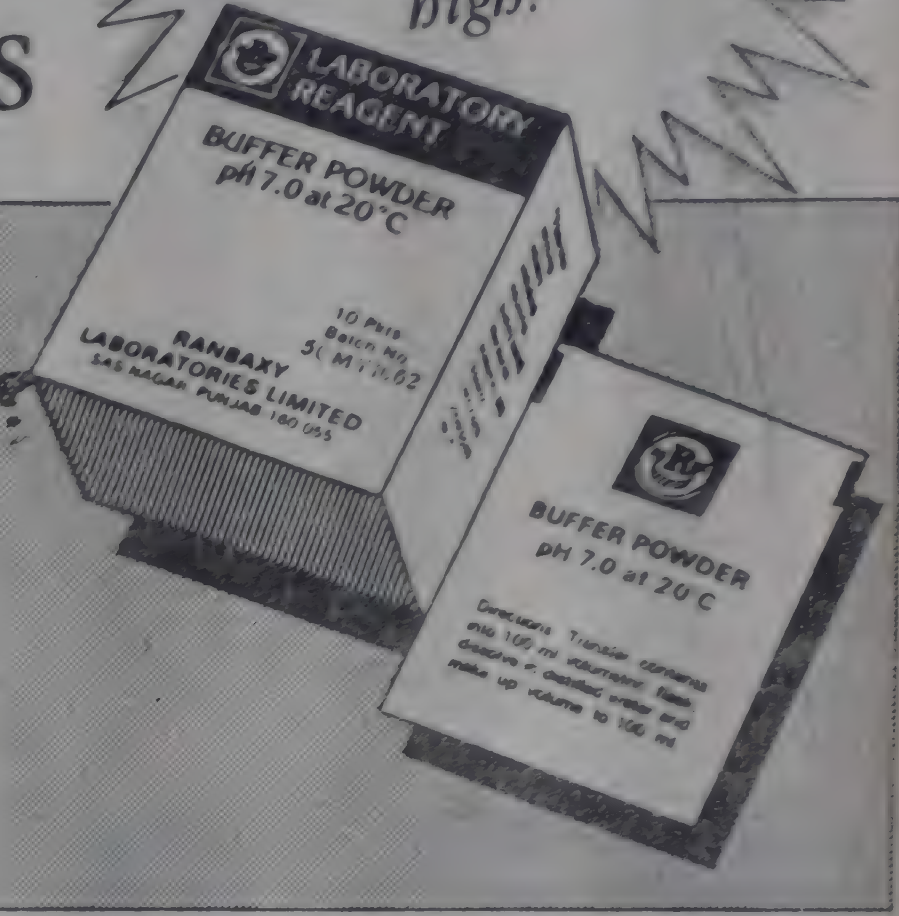

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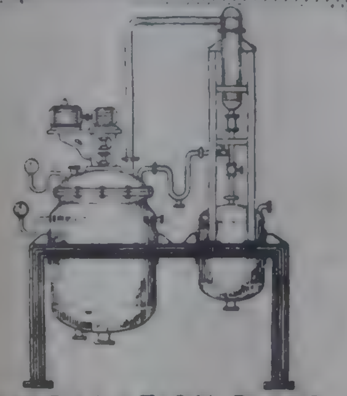

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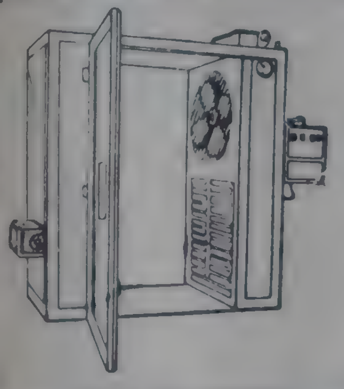

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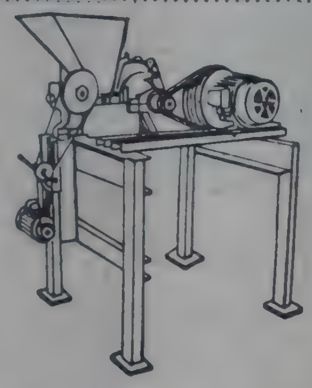

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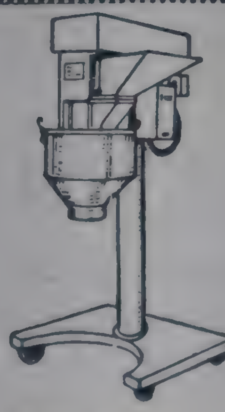

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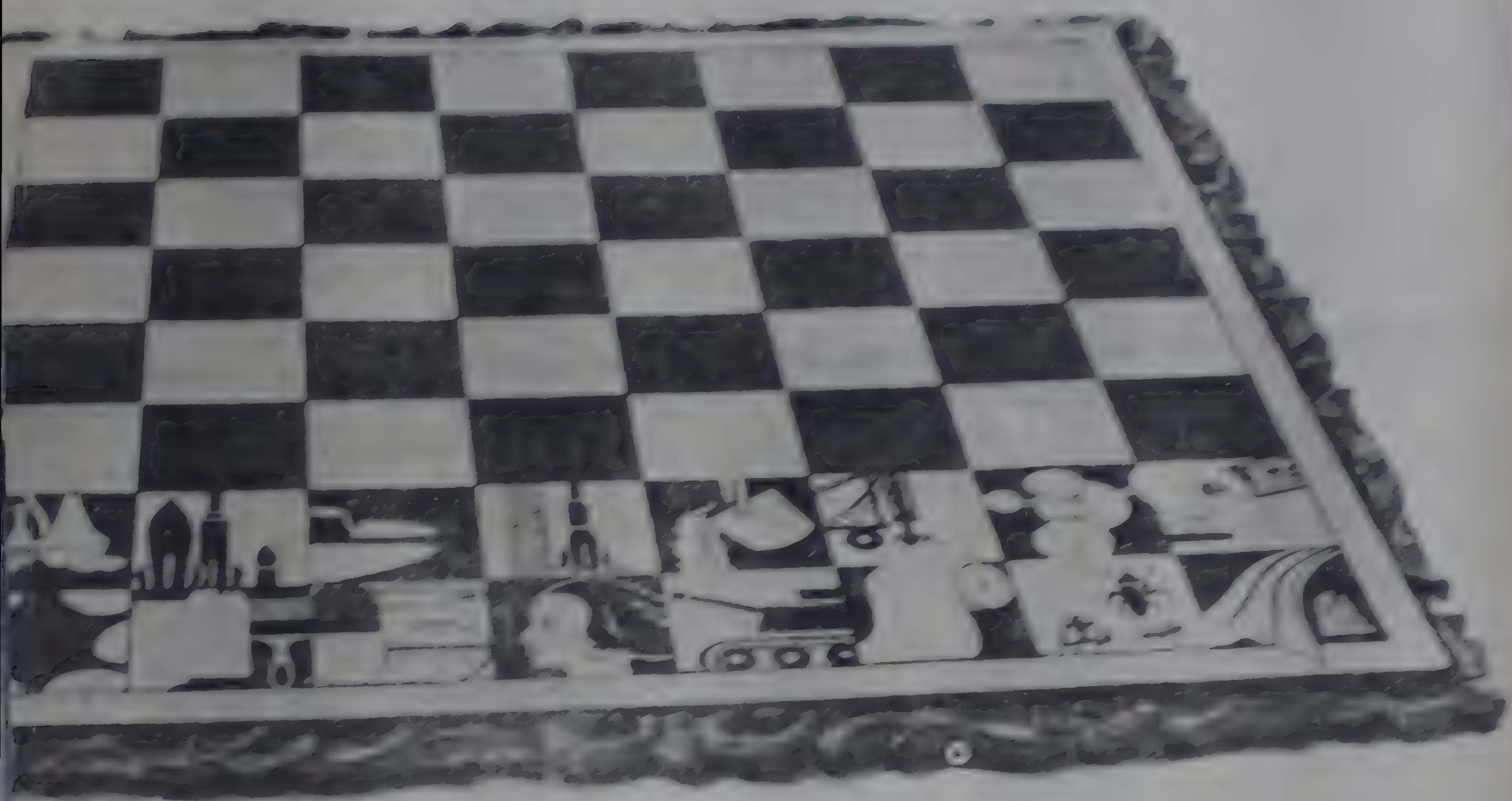

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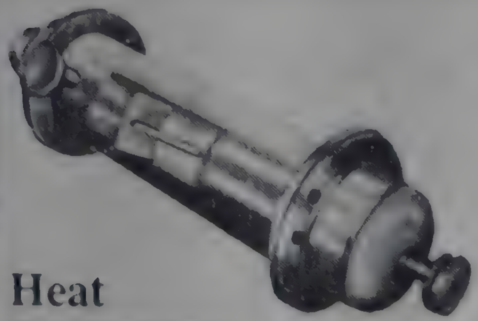

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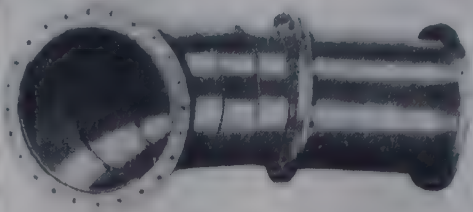

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VOL. XXXV JANUARY 9, 1990 NO. 18

HERALDING THE 21st CENTURY - 33 (a)

A Seer's Catalogue

logist Journal *OMNI* continues its soothsaying inter-
eaders of thought.

inger. Talking Heads.: The line between so-called
will blur even more than it already has because poe-
ing. More and more people will turn to the arts for
inspiration religion used to offer them. Eventually
ia — an equivalent of religion — will emerge and
psychiatry, and genetic engineering without deny-
the possible cosmologies.

rated greatly the effects new technology has on the
of people who will make art in the future. I realize
heir infancy, but they're pretty pathetic, and I'm not
that computers won't take into account nuances
mptions or anything like intuition.

ers will have any important effect on the arts in 2007.
e people with their bookkeeping, but they won't help
The video revolution, however, will have some real
the next 20 years. It already has. Because people's
ing shorter, more fiction and drama will be done on
edium for them. But I don't think anything will be
always be there, everything will find its place. Out-
ketplace and on television, will multiply and spread
freed from the need to try to please everybody.

bal video and satellites will produce any global con-
the next 20 years, but people will have a greater aware-
e communities. We will begin to notice the great artistic
de of the major cities — outside of New York, Los
London.

thor and Professor of Surgery, Yale Medical School:
that plague us today — cancer arteriosclerosis, arthri-
y infectious diseases — will fade from the scene in
cause effective ways to prevent or treat them will be
the past from my perspective as a surgeon. I see how
ether has faded from the surgical purview. Boredom
ical problem of the future B.O.R.E. D.O.M! As hu-
s life gets more and more mechanized people become
ates a dangerous situation. Our intensive — care units
with people suffering from the complications of bore-
ored we drive our cars and motorcycles too fast, we
eat to excess. We grow careless. We injure ourselves

The most important development in research in 20 years probably will be the development of antiviral drugs and vaccines that will wipe out many communicable diseases. Genetic manipulation will help us dispose of the congenital defects that have plagued society for so long. As we learn how to manipulate genes, I hope that we will not end up creating a superrace in 2010. It is a real possibility. I hope we attempt to preserve the individual nature of each human being and try not to create a race of monster athletes and geniuses, which I think will be a great temptation. We already have a sperm bank for Nobel prize-winners. The natural curiosity of man impels us further and further. We can now grow embryos for 36 hours in a dish. Well if this is the case, why can't we just grow a whole baby in a plate, moving the expanding embryo to a larger and larger dish, and finally serve a full-grown baby in a casserole to a man or woman? There is a certain absurdity to it, but why not? If we can keep the nutrients flowing, keep it in a bath of perfect salinity and temperature and feed it in certain ways, it certainly doesn't break my brain cells to conceive of it.

Our research in combating AIDS will teach us how to deal more effectively with problems of the immune system, and out of this will come, among other things, a dramatic increase in the success and number of transplant operations. In 2007 there are going to be all kinds of transplants: heart transplant, lung transplant, brain-cell transplants. One great advance will be the discovery of some mechanism by which nerve tissue can be regenerated so that the legions of paraplegics and quadriplegics can be rehabilitated. Also, there will be an intense effort to develop ways of effectively treating radiation disease, radiation syndrome. The presence of nuclear weapons and an increased dependence on nuclear power for fuel will be a constant threat. You cannot solve the problems by creating a vaccine, which is a tough enough task. But in 20 years we will work out ways to protect our bone marrow and skin from radiation.

The increased use of machines to diagnose people will make a tremendous difference in the doctor-patient relationship. The doctor will simply plug in a lot of equipment, draw blood, urine, sweat, semen, saliva, stool, analyze it, and draw inferences from that. But that's not my view of diagnosis. I'm glad I spent most of my career in medicine at the patient's bedside in an intimate kind of relationship, while it still required the diagnostic embrace.

But this relationship is dying. I see a distancing between doctor and patient. We certainly have failed the American public. The image of the medicine gives off an ill odor in this country. Doctors are seen as people more interested in having and doing than they are in feeling and perceiving. When I first began my career as a doctor, I thought that we had reached such a high plateau that we would go on with only minimal advances for an [illegible] period of time. But in the last 20 years the medical field has exploded. Technology — my God! Think of it, you can grow human skin in the laboratory and use it to treat burns. So reality has outstripped my wildest dreams in the creation of new treatments and technologies. But medicine has slipped — we have lost touch with its original impetus, the concern for each individual patient.

Robert Heilbroner, Norman Thomas Professor of Economics, New School For Social Research: There is an alarming possibility that our economy is moving in the direction of what some people call a two-tier society — a large population of people with middle-class or higher incomes and values, with a considerable bulge at the top and a large number of people who have been economically and culturally uncoupled from the main society. What's most alarming is that the ladder that has connected the bottom to the top is now missing some important rungs. There were certain industries, like the steel and auto industries, that provided more or less continuous ladders of jobs from the bottom to the top. You could enter as an unskilled person, acquire new skills, and move up the ladder into secure, unionised, betterpaying jobs. But now these industries have been seriously imperiled, and their place as employers has been replaced by what I call the McDonald's employers. More people work for McDonald's than work for U.S. Steel, but McDonald's has no ladders. The problem is serious.

A great many economists, feel uneasy about the fact that 70% of the economy does what is called service work and only 30% does what is called goods-related work. New technology keeps entering the economy and disrupting employment. When you look back at how the American economy developed, you see a migration off the farm into the factory and out of the factory into the office. The main push has come from technology. There has been relatively little new machinery to push people out of the office, but that's changing now. If the computer creates jobs in the office, the service sector will increase and there will be no squeezing of employment. But if technology bumps service people out of work. I don't know where they are going to go.

In the next 20 years the government will have to take active steps in providing work and income for the bottom one third of the population. The government grudgingly provides some sort of income, but it doesn't provide work. And work is essential for people's self-esteem and also for the building of many kinds of infrastructures that are needed in the country.

It is clear which countries are emerging as economic powers. It is entirely possible that Japan is going to be the England of the future — I mean the 1850s England. Japan may be the organizer for a 'Pacific Rim' economy — as England was for Europe a century ago. Japan may combine its leadership and technology with the inexpensive manpower and the intelligence of the Chinese, the Malayasians, the Taiwanese, the Indians, the Koreans. It is quite possible that there will be a new world economic "empire" out there, which will severely challenge the formerly undisputed hegemony of the West.

Andrew Greeley, Author, Priest, and Professor of Sociology at the University of Arizona in Tucson: Women will remake religion — both its institutions and theology. This will improve the church because it has been deprived of the emotional concern and the tenderness that women, performing at their best, bring to any environment.

We'll also see increased emphasis on the non-rational — the emotional, mystical, and poetic aspects of religion — in 20 years. We will recognise the importance of symbol and narrative. Religion is metaphor and narrative long before it becomes creed and theology. Religion is poetry before it is prose, and I think a lot of religious thought is going to develop in those directions. The emphasis on teaching religion through story is going to increase. This will be part of the feminization factor. I suspect most of us who grew up with a religious heritage pretty much absorbed that heritage through stories — the stories our parents told us, particularly our — the Christmas story, the Passover story. Stories are an enormou tant means of passing on religion — much more important mean sing on religion —much more important than theology. Formal sto novelists, screenplay writers, parents, and teachers will develop ytelling talents in order to pass on religion.

The so-called conflict between science and religion will continu and vanish 20 years from now. Oddly enough, I think the theoreti icists and some biochemists are more concerned about questions soul, and creation than are most mainline theologians, who are ut occupied with politics. They aren't paying attention to what science about the world, to the questions about how the world began or ab relationship between biochemistry and thought.

Most people have a strong feeling that science does not tell yo life means. That feeling is very strong now, and it will only grow In 20 years no one is going to claim humankind is drifting away fro gion — that we don't need religion. Of course, there will be people religious sensibilities are not very strong.

Within my own tradition, the power of the Pope definitely will Today we are experiencing the last gasp of a dying order, and in 20 most of it will be gone. There will be a new leadership more interes listening to what the people say than sermon.

David Schramm, Chairman of Department of Astronomy and A physics, University of Chicago: The next 20 years will be exciting ics and astronomy. Everything almost fits. The Big Bang looks grea we've got good ideas about the unification of the weak and electroma theories. But there are nagging questions. How do we really bring strong interaction in gravity? How do we really unify all the forces, no a few of them? What is the nature of space-time itself? What is the of the real vacuum in space? Why do we have three dimensions in as opposed to some other number of dimensions in time? There is al problem that the bulk of the matter of the universe appears to be in form that we cannot identify. It must be there but we don't know is. What is it that we call the dark matter?

In astronomy we'll develop more systematic surveys in the sky with resolution and greater intensity. In 20 years, we will have the next ration of instalments, a very large space telescope — one much large any telescope that currently exists — and an array of X-ray telescope might be able to resolve objects in space to very small dimensions. We would be able to figure out what is going on inside a quarter or what's on around the surface of a neutron star.

We are all searching for what we call the theory of everything TO we found TOE we would know how all the forces interact, how the verse began. We would test the Big Bang farther back in time than ever been able to test it.

The theory of everything would probably show that space itself is up of some hidden dimension, some other aspects. The forces that we at today are really geometric projections into our three-dimensional of some higher-dimensional space, like ten-dimensional space. This change the whole philosophical basis of space, time, and the purpose existence. It would certainly change our perspective. Twenty year was an undergraduate. And never in my wildest dreams did I think would even come close to the kinds of developments we are with now.

-- T.P.S. R

(Condensed from the interview conducted by Marion Long with Futurists and reproduced under the title "The Seers' Catalog" in OM lications International Ltd., Jan. 1987.)

EMARENA

ENKITESWARAN

LPG to Aromatics

gle-step process of getting aromatics from propane PG feedstock is now a reality and British Petrol- pioneer in this with a demonstration plant in UK. Cyclar process uses a proprietory zeolite catalyst d a dehydrogenation catalyst for the propane or corresponding olefines. After dehydrogenation there risation before cyclisation and the three steps are in one step. There is need for a continuous regen- f catalyst and for this UOP of USA have the best which is incorporated in the process cycle. The y to aromatics is said to be high at 65% while hydro- valuable coproduct to the extent of 6%. The demon- plant is of 100 tonnes a day of benzene, toluene, ix. The catalyst is also said to be further improved inal version.

nversion of C3/C4 paraffins to aromatics is certainly even if ultimate yield is only 60% of the feed --more days when naphtha is getting scarcer. The claims cyclar process will be competitive with reformer- roduction. The capital costs are not indicated at Pyrolysis fractions of naphtha cracking is of course a low cost source of benzene but pricing is the subject of relative sales value of the olefines.

BP's Cyclar process is a real brakthrough to aromatics and dependence on naphtha for reforming or cracking is reduced. There is much expectation from this latest of BP's technologies. Only recently they announced another breakthrough of propane directly to acrylonitrile without going through a separate dehydrogenation plant. We are indeed well into an era of a wide range of petrochemicals without resort to naphtha -- which could become increasingly scarce and costlier in the next ten years. India has also abundance of natural gas but rather low content of C3/C4 but there is increasing availability of C3/C4 olefines from catcracking. Methanol derived from methane is also a way to aromatics -- as per the revolutionary MTG process also based on zeolite catalysts -- but costs may not be competitive. Even ethyl alcohol can be converted into aromatics but again economics are unfavourable.

India should have a detailed look at these emerging technologies for olefines by dehydrogenation and now aromatics from C3/C4 paraffins.

Carbon Monoxide to Butanol

nproved process for getting butanol directly from nonoxide is reported by researchers of Michigan Bio- search Institute. This is a strange fermentation pro- which a new microorganism -- Butyrolacterium rophium -- isolated by them which can feed on carbon de or synthesis gas itself is used. Even sulphur containing impurities in the syngas do not affect the process. But the present levels are only 0.5 gm/litre -- an extremely low level for any commercial value.

Perhaps this has to be raised manyfold. The bacteria can also metabolise hydrogen to reduce any butyric acid.

Another Immuno-suppressant

iscovery of cyclosporin and its ability to suppress n of transplanted organs has proved a boon to the thou- f kidney and other transplant operations. Sandoz have t of $450 million for their Sandimmun. Now a new termed FK506 has been discovered by researchers niversity of Pittsburg, sponsored by Fujisawa of Japan ons of U.K. There is said to be a race for commercial pments of FK506 which is also a macrolide antibiotic about hundred times more active than cyclosporin. There is said to be much prospects for using FK 506 for diseases like rheumatoid arthritis, psoriasis, sclerosis and other diseases where the bodies own antibodies are affected.

There is a lot of tests and trials over years before the potential can be proved but approval as an IND -- Investigational New Drug -- for organ transplant is said to be clear.

Acrylonitrile From Propane

British Petroleum have already completed process work on the direct production of acrylonitrile from propane instead of going via propylene. They claim to have a proprietory catalyst which enables dehydrogenation of propane and ammoxidation of the propylene in one step simultaneously. The process is to be tried out in a pilot plant set up at their Cleveland, Ohio plant and is expected to be in commercial scale before mid 90's. The process is said to be fully viable in view of the high price differentials between propane and propylene and the difficulties for confirmed long-term supplies of propylene without tie up with a large naphtha cracke plex. Presently refinery propylene is also available from and can be used but for the other components.

Propane dehydrogenation is a reality now but if avoided in a separate plant, economies are possible if of the acrylonitrile are not affected. The hydrogen cop may cause difficulties which must have been tackled results of the test reactor and prospects of propane base duction will be looked forward to.

OPEC's Agreement

The Organisation of Petroleum Exporting Countries (OPEC) have been able to work out an agreement on production and quotas for the individual members for January/June 1990 and to get all members to sign the agreement. The level is to be 22 million barrels per day as against the present 20.5 million barrels per day which in any case has been exceeded by some members. The price will be $18 per barrel and members are expected not to lower this surreptitiously. Saudi Arabia is the largest with 24.46% share but there is the usual bickerings between Kuwait and UAE and now between Iran and Iraq. But it is expected that the new agreement on quotas will hold much better because the is better with US being a heavy importer. The Gulf tries are in a happy position of holding the bulk of reserves — 85% and so the capability to dictate terms coming years.

India's position is not a happy one with ever inc demands and no significant increase in Indian produ Apart from Gandhar, there is only the Kaveri basin potential, let alone production, is still uncertain and no prospects for any jump in the 8th Plan.

Catalysts for alpha olefines

A new class of catalysts for alpha olefines from ethylene have been developed by Union Carbide. "The heart of the catalyst system is a novel ligand promoter having phosphones and sulfonate moieties capable of bidentate coordination to transition metals." The objective was a synthetic route to the ligands possessing the phosphones and sulfonate moieties, ortho substituted phosphonic sulfonate moieties and ligands in which phosphine and sulfonates are connected short alkyl chains. Special reactions were developed lithium phosphides and sodium-2 chloroethane sulfona catalysts were prepared with nickel salts and a variety compounds with good catalytic activity for ethylene p ers (alpha olefines). The process developments for co cial use of these promising catalysts are expected.

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O.P. KHARBANDA

FRANKLY SPEAKING

Dr. O.P. KHARBANDA, Cost & Management Consultant,
510, Olympus, Altamount Road, Bombay 400 026.

R & D - Here and there

I am convinced that future of chemical industry, as indeed of any industry, lies in R & D. Further, perhaps, one can never have too much of R & D — reason enough for me to revert to this theme. Basically, R & D is an in-company activity, though Japan has excelled in supplementing this with industry-wide R & D — and with considerable success. The lesson is now being learnt elsewhere, too, for example in Europe. A formal organisation, IRDAC (Industrial R & D Advisory Committee of the European Commission) with over 400 research managers, has been serving the interest of 'consumers', big and small, in Europe. With its own Joint Research Centre and laboratories in Belgium, Italy and the Netherlands, IRDAC has started marketing its services to industry. And who do you think was its first customer? Japan! (David Fishlock: 'Why R & D muscle must be toned up', Financial Times, June 23, 1989 p. 12). Some of the existing European R & D programmes (e.g., ESPRIT in electronics and BRITE, basic research in industrial technologies) are aimed at big companies. By contrast, IRDAC, is directed mainly to help smaller companies. Its objectives, briefly are

- Have a strong multi-disciplinary network in Europe
- Coordinate national R & D efforts in order to avoid duplication
- Harmonise its standards, regulations & product approval systems
- Provide flexible training system for specialists in demand
- Use specialists even after their normal retirement.

European companies must emulate their Japanese counterparts in using the facilities of European laboratories and universities. The current fetish 'bigger is better' needs to be shifted, and far more attention needs to be paid to international collaboration. It not only
wheel', but happens to be the mos
tion to a problem. Typical of IR
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Japan really enjoys best of bo
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vity. (David Fishlock: 'A new gene
comes of age', Financial Times, Oc
two programmes, and that too at
tricity industry has been reducing
For some years, TEPCO had been
top talent. A survey as to what kin
uates wanted to work for, reveale
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expansion, TEPCO will have a new
1990's, initially for about 500 sc
At present, the in-house facility o
laboratory in Tokyo employing ab
R & D work is being carried out
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is also the biggest contributor to
CRIEP (Central Research Instit
Industry) in Tokyo, a cooperative r
of about 800, funded by all nine
panies. Its aims: To cut the cost o
[illegible] supply and to create
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Dr. Kharbanda, a Fellow of the Institution of Chemical Engineers, is a visiting professor and an author of [illegible]. His recent book [illegible]

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the execution of the Linde venture, they stressed.

Referring to another group company in Madras which Spencers Ltd. acquired last year, Mr. H.V. Goenka said its working is being studied to reactivate its operations, "We want to make it a consumer product giant exploiting its strong brand image", he noted.

Spencers will remain mainly a marketing company concentrating its operations in consumer durables. The sales turnover of the pharmaceutical division will go up from Rs. 1 crore now to Rs. 5 crores.

While explaining the features of forthcoming rights convertible debenture and non-convertible debenture issues of Ceat Tyres, Mr. H.V. Goenka said the company hopes to boost its export earnings substantially from the present Rs. 20 crores. Instead of looking at conventional markets like the USSR, Afghanistan and Pakistan, the company will be largely tapping US and West German markets taking advantage of the benefits available for truck tyre exports.

He sought to allay fears that there is a glut in the tyre market. As such there is no demand-supply imbalance. The demand is expected to maintain the current growth rate of seven to eight per cent.

It is only the small companies which are finding it difficult to meet the competition.

He also denied the charge that tyre prices have shot up heavily. They are going up only 5 to 5.5 per cent every year which is not much considering the steep increase in the cost of rubber and rubber chemicals.

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New thrust on science and technology projects soon

The Minister of State for Science and Technology, Prof. M.G.K. Menon, said recently that new thrust would be given to better co-ordination and integration of various science and technology projects to effectively implement them to benefit maximum people. Addressing a new conference he said poverty alleviation and employment generation would be given adequate emphasis.

He said the Government would take steps for the proper management and utilisation of the existing infrastructure. The existing projects would be reviewed with a focus on ascertaining the achievable points and the missing links, he said. There was nothing wrong in the present science policy and there was no question of any sudden change, he said.

Asked about the reported statement of the Minister of State for Environment and Forests, Mrs. Maneka Gandhi, against the nuclear power generation programme, Prof. Menon said the Government had not made any statement on the subject.

On the Soviet offer for nuclear power plants, he said no detailed project reports had been signed so far. The ongoing projects or India's stand on the nuclear proliferation treaty would not be violated in any case. Asked whether there was any proposal to scrap the scientific advisory council, he said he was yet to look into that question. He said a proper linkage between research laboratories and the industry was essential. The in-house research and development in the industry should be encouraged.

Asked about the review committee's report on the Council of Scientific and Industrial Research (CSIR), Prof. Menon said there was no question of reviewing the report. Practical problems could be looked into individually. Replying to a question on the re-entry of American multinational IBM, he said there was no application from them for this purpose. A wide range of questions would have to be examined in taking decisions on such issues.

Prof. Menon said there was no move for centralisation of various scientific departments or laboratories. The success depended on the way their roles were defined and various teams brought together for appropriate subjects.

TWO MINERAL UNITS TO BE SET UP IN THE SOUTH

Two mineral units would be set up, one each at Kuthiraimozhi in T Nadu and Beeminipatnam in A Pradesh, at a cost of Rs. 25 crores Mr. R.K. Garg, Chairman and Ma ing Director, Indian Rare Earth said in Nagarcoil recently. Speak a function here, he said work on projects would begin during the cu financial year. The environmen forest clearances are awaited.

LARSEN APPOINTED CHAIR MAN EMERITUS OF L & T

Mr. Holck Larsen, who holds than one per cent stake in Larsen Toubro Ltd. has been appointed ch man emeritus of the company. Larsen, who is one of the founder the company was unanimo appointed to this new post, at a bo meeting held on December 30, 1 Mr. Larsen's new appointment is a ting tribute to his outstanding contr tion in setting up one of Ind engineering conglomerate, along Mr. Soren K. Toubro.

CORRIGENDUM

In the write up titled 'Ram Bros. Get-together' published Chemical Weekly dated 2nd Ja ary, page 42, the name of the Exe utive Vice President was wrong spelt. It should correctly read **Mr. S.G. Makim, Executive Vi** President of Indian Organic Che icals Ltd. The error is regretted.

-- Edi

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Top scientists to attend first superconductivity seminar in India

A galaxy of top scientists from the global superconductivity research community are expected to attend the first ever International Conference on Superconductivity being held in the country at Bangalore between January 10 and 14. Apart from invited talks by well known researchers in the field from both India and abroad, over 400 research papers are to be presented at the conference, organised jointly by the Superconductivity Programme Management Board and the Department of Science and Technology. Around 450 delegates are expected to participate in the four-day conference. According to Prof. C.N.R. Rao, chairman of the Superconductivity Programme Management Board, the conference will help give a sharp focus to the research and development work in the field being conducted within the country as well as provide an opportunity for Indian scientists to interact with leading scientists from the advanced countries.

Three years after the phenomenon of superconductivity the world saw a sharp spurt of renewed interest following the discovery of superconducting compounds with high transition temperatures Prof. Rao feels the initial enthusiasm still continues. Pointing out the especially large-scale investments in the development of commercial devices using superconducting materials by major multinationals like the IBM, Du Pont, Hewlett Packard and the Japanese Matsushita Electric Industrial Co. and Fujitsu Ltd., he says a host of electronic and diagnostic devices are already being marketed abroad. While the manufacture of high power magnets and generators with the help of superconducting materials is still quite far off from present technical capabilities, according to him the near future is likely to see a wide application of sensor devices made with the new materials.

In India, owing largely to timely investments of a large amount of funds into superconductivity research for the past couple of years, at present over 58 groups in 31 institutions are working on different aspects of the subject. Since being set up in June 1987 the Programme Management Board has sanctioned nearly Rs. 19 crores to various institutions to set up infrastructure for research through two task groups one on basic research and the other on applications.

According to Prof. Rao, while the Indian researchers are on par with leading laboratories abroad on the basic sciences side, especially in the synthesis of superconducting materials and the study of their structure and properties, the country lags behind considerably in the industrial applications of the new technology.

This, he feels, is largely d
lack of any work whatsoever
conductivity within the countr
1987 and the consequent lack
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was not available domestically
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Despite these constraints Pr
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SQUIDS which will be used
detection of magnetic fields of v
intensity for geological as well a
cal purposes are being worked u
two groups at the National P
Laboratory. (See p. 62 for earlier

Workshop on Export Promotion for Dyes and Chemicals

The Gujarat Industrial and Technical Consultancy Organisation Limited and the Gujarat Dyestuff Manufacturers Association are jointly organising a two-day workshop on export growth opportunities for dyestuff/chemical producers at Ahmedabad on January 18/19, 1990.

The workshop is being sponsored by Industrial Development Bank of India (IDBI). Shri Ramu Deora, Chairman, Chemexcil will inaugurate the workshop and Shri K.U. Mada, Executive Director, IDBI will be the chief guest. The main objective of the workshop is to develop a culture of export orientation in existing units and to provide appropriate guidance in that behalf. The workshop is meant to provide to the participants a detailed idea regarding international market conditions, schemes of financial assistance, credit guarantee, export procedures and working of an export house.

Besides, the participants will be
cated on the policies & procedur
various departments and institu
concerned with exports. Lea
experts in the field will share
knowledge and experience with pa
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The workshop will cover the
lowing themes: 1. International ma
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exports: Strengths and weaknesse
Import export policies and procedu
4. Assistance from commercial ba
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active exporters.

Entrepreneurs in dyestuff, dyes
intermediate and chemical indust
are welcome to attend this worksh
Those interested may contact: Guja
Dyestuff Manufacturers Associati
A-501-502 'Doctor House', Nr. P
imal Railway Crossing, Ellis Brid
Ahmedabad 380 006. Phone: 40

CT reviewing caprolactam unit

authorities in Kerala are
iew of its Rs. 350 crore
plant set up with Holland's

was scheduled to start pro-
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May this year -- a delay
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s. Caprolactam imports in 1988-89 are put at 40,709.61 tonnes valued at Rs. 11,165.57 lakhs while that in 1989-90 (April to October) is placed 16,100.80 tonnes valued at Rs. 4848.47 lakhs, indicating a drop. Output of nylon filament yarn in 1988-89 is put at 35,758 tonnes.

CENTRE TO MONITOR OCEAN POLLUTION PLANNED

A centre for monitoring ocean pollution is proposed to be set up by the Union government in Bombay.

This was disclosed by Prof. V.K. Gaur, Secretary, Union Department of ocean development, in Trivandrum on January 2, 1990.

The Bombay centre would be supported by smaller monitoring units to be set up in coastal states and island territories, Prof. Gaur said.

He was speaking on "Indian programme for ocean development in the 1990s" at a seminar on ocean science and technology, organised in connection with the annual general meeting of the Indian National Science Academy.

India being a country with 8,000 km. of coastal line and nine coastal states, the ocean could play a very important role in its future development, Prof. Gaur said.

In the new decade India would have to acquire better understanding of the ocean structures, which it was unable to in the last decade, and develop the exploration and exploitation of ocean resources, he said.

He said in the period ahead much attention would have to be paid on gaining greater understanding of the ocean circulation patterns, chemicals, biosystems of the ocean, evolution of shoreline dynamics and coastal dynamics.

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NCL'S SINGLE STEP PROCESS

New tech. to make ethyl benzene

A revolutionary breakthrough in petrochemical process technology, for producing ethyl benzene from alcohol in a single step instead of from ethylene, called the 'Albene technology,' has been developed by the National Chemical Laboratory (NCL) Pune. It has been successfully translated into production on a commercial scale by Hindustan Polymers (HP) at Visakhapatnam, a unit of McDowell and Co. Ltd. of the United Breweries (UB) group.

This was announced recently by Dr. R.A. Mashelkar, director of NCL and Mr. R.B. Bhargava, president of the polymer division of McDowell.

Ethyl benzene is an important intermediate in the manufacture of styrene monomer, used in the production of polystyrene which is the feedstock for the plastics industry. For the first time there is a bright possibility of exporting this technology from India to other countries, Mr. Bhargava said.

Mr. Bhargava said the company had started a dialogue in 1985 about this catalyst, as they saw great potential in this process. Once they had a close look, they had no hesitation in trying it as their experience with the foreign technology was not very happy, he mentioned.

"We had problems of safety and had to import accessories for trying the earlier technology. We were also a little unsure of ourselves as adopting the NCL's technology meant stopping the production at the existing plan'', he said.

Mr. Bhargava said that the NCL technology was efficient, conserved energy and could be engineered safely.

The revamped pla
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Mr. Bhargava s
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News in Brief

-EXPORT POLICY REVIEWED

ovemment is reviewing the xport policy to eliminate non- imports. This was stated in the bha on December 28, 1989 by ce Minister Mr. Arun Nehru in a question by S.S. Thakur and hwant Sinha whether the gov- proposed to review the long- port-export policy with a view nating non-essential imports.

Nehru said that the review was ndertaken in conjunction with lated aspects which have a bear- imports. The aims of the review d enhancement of exports with lar reference to higher value- exports, imports compression, aking available necessary inputs domestic economy in accordance he government's developmental ies, the minister explained.

NE LAID FOR TPL PROJECT

Tripura Governor Sultan Singh he foundation stone of the Rs. 124 methanol project of the newly d Tripura Petrochemical Ltd.) at Uttar Brajapur in West district ecember 27, 1989.

e gas based 300 tonne per day city unit, is the first of its kind in tate, which is likely to begin com- ial production after three years. The is expected to promote a number ownstream industries.

he public-sector Rashtriya Chemi- and Fertilisers Ltd. (RCF), Oil and ral Gas Commission (ONGC) and ura Industrial Development are ly collaborating in the project, ch will utilise more than 3.15 lakh c metres of natural gas.

early 250 people are likely to get ct employment in the project. State Chief Secretary I.P. Gupta has been named the Managing Director of TPL.

GUJARAT WANTS MORE ROYALTY ON CRUDE OIL

The Gujarat Chief Minister, Mr. Madhavsinh Solanki, has urged the Prime Minister to consider urgently the memorandum submitted by the State Government in March 1988 for revision of royalty on crude oil.

In a telex message, Mr. Solanki said any arbitrary fixation of royalty would deprive the State's exchequer of its legitimate revenue. The Union Government had fixed the crude oil royalty rate at Rs. 192 per tonne from April 1, 1984, he said, adding that this rate did not reflect the intrinsic value of crude oil.

Mr. Solanki suggested that while fixing the new rate of royalty, oil producing states should be taken into confidence. He felt the matter of crude oil royalty was causing great concern in the state.

IBP NOMINATED FOR SETTING UP ASSAM REFINERY

The Government has "nominated" the State-owned IBP Company Ltd. for setting up an oil refinery in Assam, as part of the Assam accord.

The Assam Government will be the company's partner in the project, which is expected to go on stream within four years, according to the company's 81st annual report for 1988-89.

After almost half a century, the company will stage a "resurrection" and once again be in a position to have its own refinery base, which had been lost during the second-world war, the report said.

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IPCL registers sales turnover of Rs. 1036 crores

The state-owned Indian Petrochemicals Corporation Limited (ICPL) has registered an impressive sales turnover of Rs. 1,036 crores in 1988-89 as compared to the mere Rs. 5 crores in 1973-74, the first year of its sales.

According to the 1988-89 annual report of the corporation laid in Parliament recently, the reserves and surplus of the company, which were a modest sum of Rs. 4.96 crores in 1973-74 had risen to Rs. 402 crores in 1988-89.

The corporation set a new record in its operation during the year under review by successfully establishing the viability in the use of plastic crates for apple packaging through the application of polypropylene copolymer (PPCP) by the introduction of 20,000 crates by Himachal Pradesh Marketing Corporation.

The developmental efforts of IPCL further conclusively revealed that the milk crates made from PPCP were superior to the crates made with high density polyethylene (HDPE), the report claimed.

Pointing out that the use of PPCP in automobile bumper compounds was developed, the report said an application base for use of plastics in furniture and in food packaging was also established. During the year, roughly 1,000 kms. of canal lining with agri-film was taken up.

In the field of chemical products, a new solvent cixon was introduced which would supplement the needs of rubber, adhesive and solvent industry. In the area of fibres, a market base was established for the corporation's dry spun acrylic fibre (supacryl). In collaboration with Khadi and Village Industries Commission, a project on handmade acrylic knitting yarn for use in amber charkha was launched in July 1988, the report said.

On new projects, the report said acrylic fibre expansion project of 12,000 tonnes per annum was commissioned and production of monocomponent fibre started.

The report said the mechanical completion of xylenes expansion project for raising the capacity of ortho-xylene unit from 21,000 to 45,400 tonnes per annum and that of paraxylene unit from 17,000 to 48,600 tonnes per annum was generally over. Integration of this new facility with the existing operating plant is slated for completion during the current year.

The report said the overall physical progress of the Maharashtra gas cracker complex as on end-March this year is 84 per cent and the cumulative expenditure incurred till the end of March this year was Rs. 906 crores.

The corporation is also establishing a carbon fibre pilot plant with associated product application development centre as part of its R and D activities at a cost of Rs. 31 crores with a foreign exchange component of Rs. 13.23 crores.

OIL TO BEGIN DRILLING OFF SAURASHTRA COAST

Oil India Ltd. (OIL) plans to take up exploratory drilling for oil in the Saurashtra offshore area after the monsoon. The company has drawn up a three-well programme for drilling in the area, for which it is getting a petroleum exploration licence (PEL). Though the petroleum ministry has already communicated its decision to give the PEL to Oil India, the exact demarcation of the area to be given to Oil India is yet to take place because of claims to certain parts of the area made by the Oil and Natural Gas Commission (ONGC).

Oil India has already opened a project office at Rajkot and issued inviting tenders for exploratio first well is planned to be dr 1991-92 and the next two wells o next year. The total amount plan be spent on exploration and dril the area is estimated at Rs. 78

Locations for drilling will be de on the basis of fresh surveys an data about previous exploratory made in the area are being obtain Oil India from ONGC.

It may be mentioned that the company -- Chevron -- was awar concession in the area and it dr three wells during the 1982-84 pe Two of the wells were drilled t middle miocene shale formation. well was drilled to a depth of metres and the other to 3,600 me Both the wells proved dry. How the third well drilled to a depth of metres indicated presence of minor

In the adjoining Kutch offshore exploratory drilling has been carried by the U.S. company -- Reading Bates -- as well as by ONGC. Reac and Bates had drilled two wells in Kutch basin in 1976 and 1977. The well had shown some indications of and gas while the third well show only minor traces of gas. ONGC fo some oil in the Kutch basin in a drilled by it in 1984.

NYLON CORD PRICES CUT

The prices of nylon cord has be slashed by about Rs. 2,100 a tonne the manufacturers with effect from Ja uary onwards. According to the Ass ciation of Synthetic Fibre Indus (ASAI), the revised price of nylon cord fabric would be Rs. 128 to Rs. a kg. depending upon the quality/sp cification. Although the reduction c.i.f. price of caprolactam is subs tially neutralised by higher dollar/rup parity, the industry has passed on benefit of reduction to manufactur claimed ASFI.

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ar electron accelerator: Provision of a linear electron accelerator is also part of the project. Radiation effects on biological systems can be studied with the help of the accelerator. It will encourage research into radiation chemistry, especially mechanisms of reactions arising from interaction of radiation with chemical systems.

The Nuclear Science Centre will also strengthen research using lasers, trace analysis, and radiation biology.

A pico-second and a nano-second laser with associated facilities are also envisaged under the project. Trace Analysis, used in characterising ultra pure materials, environmental monitoring and industrial quality control, is also being given a boost.

The radiobiological lab will have facilities for work on radiation biology, ecology, genetics, and physiological ecology. Gamma radiation source, DNA sequencing and chromosome mapping equipment are the highlights.

The project has been given the green signal and the university senate is to vote a Rs. 2 crores grant for the buildings. The centre will be under the joint control of the Department of Atomic Energy and Madras University, manned by a 35 member team, including 15 engineers and technicians, two scientists, and a medical officer specialised in nuclear medicine.

IGCAR has pointed out in the project paper prepared by Dr. C.K. Mathews (IGCAR) and Prof. P. Natarajan (Madras University) that three or four accelerators now available fall in the KeV range, and it is necessary to have a high current medium energy cyclotron in the MeV range.

A compact machine from Belgium, the "Cyclone-30" is preferred by the scientists to a Japanese machine. Though both are in the MeV range, the Belgium machine has higher intensity. The proposal for the chemistry oriented nuclear centre is a step further in the ongoing collaborative agreement between Madras University and IGCAR, Kalpakkam.

SUITABLE POLICY FOR PLASTIC SACK UNITS URGED

The All India Flat Tape Manufacturers Association has called for evolving suitable short-term and long-term policy guidelines for the survival and growth of the plastic sack manufacturing units.

In a memorandum submitted to the deputy chairman of the Planning Commission, Mr. Ramakrishna Hegde, the president of the Assocaition, Mr. Tikam Patni has stated that owing to the compulsory use of jute bags, the cement and fertiliser industry were incurring additional packing costs of Rs. 176 crores and Rs. 120 crores respectively.

Massive losses are also being sustained by these industries consequent to the spillage and spoilage of commodities packed in jute sacks.

"Despite this, it is strange that the report of the sub-group on jute industry for the Eighth Plan has recommended the continuation of the mandatory jute use order through the year 1994-95", Mr. Patni stated. According to him, the report of the jute sub group relating to the compulsory use of jute sacks should be kept in abeyance. A financial survival package should be developed to avoid permanent closure of the plastic sack manufacturing units, he said.

ACTING CHIEF FOR HPCL

Mr. S.T. Bambawale, Director, personnel and administration, has been asked to take additional charge as Chairman and Managing Director of Hindustan Petroleum Corporation Limited. The post fell vacant after the retirement of Mr. M.K. Bagai will be filled in due course through normal governmental procedures.

GNFC pays 10 per cent

Gujarat Narmada Valley Fertilisers has declared a dividend of a rupee per equity share of Rs. 10 each for the year 1988-89. This was disclosed by Mr. Rohit Mehta, Chairman, GNFC while addressing the annual general meeting of the company at Broach on January 1. It may be recalled that the company had passed over the dividend but now it has revised its earlier proposal.

He disclosed that the company could get the permission from the Company Law Board for providing depreciation at lower rates following the representation made by the company. He stated that there had been a wide gap between the depreciation provided by the Companies Act and the depreciation available to it under the revised RPS with the result that the company had not been in a position to declare any dividend for the year 1988-89.

According to him an amount of Rs. 27.27 crores will be available for appropriation. The Re. 1 dividend will work out to 13.33 per cent on an annualised basis.

Mr. Mehta pointed out that the cumulative effect of changes in the RPS of the Union Government has affected profits of GNFC during 1988-89 (nine months) despite record production and sales during the period. The norms of capacity utilisation and the life of the plant for calculation on depreciation have reduced the gross profit of the company by Rs. 43 crores.

Mr. Mehta also informed that the Union Government had approved the foreign collaboration for its TV glass sheet project with OI-NEG TV Products, Inc., USA to be set up by the Gujarat Narmada Valley Fertilisers Company Ltd.

He added that a separate company had been set up for this purpose and the foundation stone was laid only in October last year. Construction work will be started after getting approval from financial institutions, he added.

Discussing the progress at GNFC, Mr. Mehta informed that the promise to commission three projects during 1988-89 had been fulfilled. GNFC had commissioned its captive power plant phase II 25 MW, India's largest formic acid plant 5,000 mtpa and the country's largest printed circuit board plant with annual capacity of 44 sq. mtrs. The performance of captive power, butachlor and EPABX plants are commendable. The formic acid plant operation has also stabilised and GNFC has entered the export market amidst severe international competition.

The concentrated nitric acid plant in the prestigious Rs. 237 crore nitrophosphate project was commissioned in October 1989. With the completion of the weak nitric acid and ammonium nitrophosphate plants
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from naturally occurring sources, such as cosmic rays from the Sun and terrestrial radiation, are about 0.1 rem per year. A routine chest X-ray gives an exposure of 0.06 rem.

The committee cited new data showing that Japanese survivors who were in their first six months of pregnancy at the time of the Hiroshima and Nagasaki atomic bomb attacks produced children with lower-than-average intelligence test scores and school performance. It noted that the detrimental effects on intelligence may be due to the rapid development of foetal brain tissue, especially during the period eight to 15 weeks after conception.

NEW METHOD TO CREATE MONOCLONAL ANTIBODIES

In what is considered a major advance in biotechnology, a team of Californian scientists have devised a new method of creating monoclonal antibodies, which are widely used in medical diagnosis, experimental cancer treatments, and basic research in immunology and disease.

The new technique will allow companies to make these pure, uniform and highly sensitive substances thousands of times faster, in greater quantity, at lower cost and with less guesswork than by the current method. It will also have a major effect on the biotechnology industry. But the greatest payoff is expected to be the ability to tap the human immune system as never before, tailoring human cells to attack diseases like cancer and AIDS.

The technique simplifies a process that has been used to make the antibodies. Scientists have been using mice to produce the antibodies in a laborious and technically difficult procedure that produces few cells. With the new method, scientists identify the genes that carry the blue-print for antibodies. They put the genes into viruses and infect bacteria with the viruses. The bacteria then produce antibodies, which can later be reproduced in vast quantities.

The current method did not use bacteria because of technical difficulties, and scientists could make only mouse antibodies, which are not as effective in humans.

In general, antibodies attack foreign substances, like viruses, bacteria or transplanted cells that invade the body. To attack, antibodies seize proteins found on the surface of the invader — like keys fitting locks. When a white blood cell recognises a foreign protein, it multiplies to form a clone. Each cell in the clone produces an identical antibody to attack the foreign protein.

A human is born with about 100 million different antibodies, ready to meet an invasion. Although antibodies can be extracted from human tissue, they do not survive outside the body under laboratory conditions.

To produce monoclonal antibodies artificially in mice, the scientists injected them with foreign proteins. Later, they removed the spleens, newly made rich in white blood cells, and fused them with a kind of cancer cell that never dies. Some of the fused cells grew like cancer cells, but made monoclonal antibodies. But for reasons not well understood, only one in a million cells fuse in any one experiment and this yields only a few thousand antibodies to test for commercial value.

FIRE IN GUJARAT REFINERY

A fire broke out in the Gujarat refinery at Koyli, near Baroda on December 31 causing damage to the FFC plant.

The cause of the fire was stated to be leakage of carbon hydro from the refinery pipeline. Fire brigade rushed to the spot and extinguished the fire.

No one was injured in the blaze.

BICP, Ministry spar on adding drug R & D cost

The Drugs Ministry and Bureau of Industrial Costs and Prices (BICP) disagree on loading of research costs in calculating drug prices. The ministry wants to include the full costs of research in the prices of controlled bulk drugs, while BICP is prepared for only a 50-per cent load factor. The divergent approach has stalled a decision on the issue which is critical to at least some drug companies.

Industry is rather surprised over the BICP stand as it usually does not take policy stands. Perhaps, BICP feels the current mark-ups of 75 and 100 per cent on price-controlled formulations cover a large portion of research costs. The mark-ups, though liberal, are partly eaten away by trade margins, disputing the analysis of BICP.

At the last OPPI meeting, Mr. M.S. Gill, the Pharmaceuticals Secretary, had talked of a Government decision to fully reimburse research costs. Except for Hoechst, there is virtually no other company which invests on basic drug research. After investing around Rs. 4 crores per annum Hoechst research centre has not been able to land upon any drug to recover costs. A favourable decision will help this company as much as others, who have been laying emphasis on process research.

By designing new processes a large number of Indian companies have been able to launch new drugs. In fact most of the drug companies with foreign equity have no basic research facilities.

NEW STRATEGY TO CONTROL AIR POLLUTION

The Ministry of Environment and Forests has evolved a comprehensive strategy to effectively control air pollution through emission of lead, carbon monoxide, nitrous oxide and hydrocarbons by automobiles.

The approach involves shifting to the use of lead-free petrol, design modifications for automobiles and strict monitoring of emission standards. An official release recently quoted the Minister of State for Environment and Forests Mrs. Maneka Gandhi, as emphasising the need to shift to lead-free petrol to prevent health hazards due to high lead content in air.

Speaking to Doordarshan, Mrs. Gandhi said the nation could not afford to suffer the deleterious effects of mental retardation and progressive diminution of height of the offsprings due to high lead content in the blood. A plan to reduce lead content in petrol to the accepted 0.15 grams per litre by 1993 is under active implementation which could be preparatory to shifting to lead-free petrol, the release added.

GARWARE POLYESTER BAGS R & D AWARD

Garware Plastics and Polyester received the national award for indigenously developing the technology for medical and industrial X-ray films. The award was presented by Mr. M.G.K. Menon, Union Minister for Science & Technology at the inaugural function of the Third National Conference on In-House R & D, organised jointly by the Department of Scientific and Industrial Research, Government of India, and the Confederation of Engineering Industry in New Delhi on December 31.

Up to now, only a few companies like Kodak, Du Pont, Agfa and Fuji had the technology for making X-ray films. Garware's indigenous development of this technology marks the first time that this technology has been developed in any third world country. The entire process, right from making the polyester chips, extruding the film base along with a blue dye to make it suitable for photographic use, manufacturing the silver halide emulsion
coating process had be
entirely in-house. The
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polyester-base film, as
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makes sharp, clear imag

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sector. Earlier, BHEL's Tr
the award in the mechan
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presented by the Minister
Science and Technology,
Menon to Mr. S.K. Har
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comes these disadvantages

vival: Karnataka accepts RCF proposal

a Government has
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press conference in
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, said that the accum-
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rehabilitation proposal,
proval of the Union and State Governments, envisages RCF holding 51 per cent of the equity base, raising Rs. 60 crores for immediate requirements, providing working capital, if necessary, and "taking a flexible stand and investing Rs. 200 crores to Rs. 300 crores" in modernisation by RCF.

MMTC CUTS COPPER, TIN PRICES

The Minerals and Metals Trading Corporation of India announced recently a reduction in its selling prices of copper, tin and nickel. A release of the Corporation said that price of copper had been reduced by Rs.1,500 per tonne, of tin by Rs. 3,000 and of nickel by Rs. 4,000.

The prices of copper, tin and nickel have been reduced due to fall in international prices, it adds. The prices o
zinc and lead remain unchanged at la
month's level.

The ex-godown prices for sale fro
all godowns of the Corporation exclud
ing sales tax, octroi and the like whic
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Copper cathode 79,955; Continuou
cast copper wire rods 88,500; Electro-
lytic high grade zinc 50,500; Specia
high grade zinc 50,700; Pig lead 99.9
per cent purity 29,500; Pig lead 99.9
per cent purity 29,700; Tin 2,97,000;
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MADRAS REFINERIES

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l to invest Rs. 400 cr. in NOCIL

l Dutch Shell of the Neth-
agreed to invest Rs. 400
ding a hike in equity stake
Organic Chemical Industries
L) from 32 per cent to 40
part-finance its Rs. 1,700
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s well, it will be one of the
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rces feel this should not affect
al freedom of Mr. Arvind
Chairman. The sources admit
may have to be imported if
ilability shrinks and this could
d by a targeted annual exports
0 crores that NOCIL is work-

arties are working out details and firm financial proposals will surface by middle of this year for work to start sometime early next year. Shell is vetting its financial involvement through various committees even as managers at Mafatlal House toothcomb problems and solutions.

Recently NOCIL got a letter of intent to expand its capacity with an investment of Rs. 1,700 crores, the ethylene capacity is to be pushed up from 63,000 tonnes per annum to three lakh tonnes per annum, of propylene from 37,000 tonnes to 140,000 tonnes per annum apart from that of 16 other petrochemicals and intermediates. As the expansion comes through, the Thane complex output is expected to jump from 247,000 tonnes per annum to a whopping 1.39 million tonnes per annum.

And that is precisely the problem NOCIL management is still facing. As the letter of intent gets converted into an industrial licence, the shrill voice of environmentalists is bound to get shriller.

The issue is lying in the courts and a final decision will influence the Government's Environment Ministry. Company sources are hopeful of a favourable decision and Shell is working on that promise.

INDO GULF FERTILISERS

Indo Gulf Fertilisers and Chemicals Corporation has earned a gross profit of Rs. 30.65 crores during the six-month period ended September 1989 on net sales of Rs. 152.23 crores. As the project was under construction during the corresponding period last year, there were no sales and profit figures for the period.

With the provision for depreciation being Rs. 33.69 crores, there is a loss of Rs. 3.04 crores during the period.

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Quantum jump in knowhow exports: a far cry

A quantum jump in the export of technology is difficult to achieve, although over the years India has developed a good infrastructure and expertise for planning and executing a wide variety of projects, according to Mr. D.S. Arora of the Indian Institute of Foreign Trade.

This is because manufacturing units and consultancy units spread over a fairly wide area are suffering from numerous problems on account of infrastructural deficiencies and ignorance of overseas technological requirements in terms of quality, specifications and cost.

Of nearly 200 consultancy firms, only about 20 are engaged in export business. The same is the situation with regard to project and capital goods exports.

Further, although India had successfully sold some simple and labour-intensive technologies to a number of developing countries in the past, there had been a distinct shift in their requirements.

This is due to greater exposure of newer processes and equipment from our counterparts in other countries, according to Mr. Arora.

This problem is, however, more acute in areas where the demand for a particular knowhow or machinery item has reached a saturation point.

The only alternative for survival in such a situation would be laying more emphasis on newer industrial processes, improving engineering designs and making construction methodology more efficient.

Another important factor, Mr. Arora identifies, is the lack of a proven track record in executing large projects. Indian image is not quite bright in the Gulf countries, according to him.

Again some of the clients in these countries are interested in awarding project work on package service basis, which many of the Indian companies are not able to undertake.

As per current indications, the complexities of new projects emanating from this region are, however, growing both in terms of size and cost.

With a view to successfully completing the whole job and taking benefit of overseas project business, Indian units are specialising in different activities to come together and form consortia.

In the circumstances there is an urgent need for integrated strategy aimed at establishing a stronger technology base which would inject a qualitative change and confidence in this growth area, so that it can successfully sustain itself in the changing requirements.

SUPERCONDUCTOR DEVICE FABRICATION IN A YEAR

The country's first superconductor device with commercial applications will be fabricated in a year.

The device could be in the form of the SQUIDS (superconducting quantum interference devices) used in geoprospecting for minerals and medical diagnosis, or the IR Detectors. While the National Physical Laboratory (NPL) in New Delhi and the Indira Gandhi Centre for Atomic Research have been assigned the task of making the SQUIDS, scientists at the Central Electronics Engineering Research Institute at Pilani are working on the detectors.

The fabrication of these gadgets figure in the list of priorities drawn up recently by the National Pr Management Board (PMB) on su conductivity.

The Chairman of the Boa Director of the Indian Insti Science (IISE), Prof. C.N.R. Ra that efforts to manufacture ma generators and superconducting and tapes would also be accord ority. With these endeavours, the try would be able to rise to interna levels in the area of supercond applications.

Prof. Rao said the country's la tories had done reasonably good in the area of basic research. Superc ductors with temperatures as hig 125K (minus 148°C) were being However, lack of adequate infras ture and the onus on scientists to thesise the superconductors, stud characteristics and carry out va measurements all by themselves w impeding research. "In most of the labs in the world, if somebody ma a new compound, there will be others doing various measurements added.

He said that so far, the Board released Rs. 18 crores to improve quality of facilities in various insti tions. The Board would require ab Rs. 100 crores to build all the labs scratch.

Prof. Rao said work was also circumvent problems of current de (current carrying capacities) and ma tic flux lattices. He was confident some process would be evolved to come these problems.

He said PMB in collaboration the Department of Science and nology (DST), would organise a day international conference on s conductivity in Bangalore from Ja

A number of scientists of inte tional repute would attend the ence, he added.

ETROCHEM PROJECTS

'hapars to revive scheme

ed house of Thapars is an earlier financing petrochemical projects o foreign exchange

ive move, the Thapars Russian firms for set- mical complexes in the viets had also agreed to d machinery to the Tha- rupees and were even rt technology not avail- SSR from the western rovide it to India against s.

s were also amenable to loans to the Indians at t exceeding five per cent

ars first mooted this technology-cum-finance package while bidding for the aromatic complex in Saleempur. The proposal included turnkey erection by the Russians and incorporated the import of the PTA technology from France — to be paid for in Indian rupees. The Thapars, however, were late in submitting their proposal and, therefore, lost out to the Singhanias.

After Saleempur, the Thapars told the Union government that the Russian package was available to all petrochemical projects that required government sanction. However, on account of the different set of priorities of the previous government and due to the impending general elections, the proposal was not considered seriously. The Thapars have now thought of reviving the proposal in the face of severe foreign exchange crunch faced by the country. The new government is likely to call for a reappraisal of projects in the energy and petrochemical sectors which involve very heavy drain on foreign exchange. Already an empowered group has been set up in the Planning Commission to see if some of these hard currency-intensive projects can be deferred.

While it is claimed that Russian technology may not be at par with what is available in the western countries, the cost benefits of rupee payments and soft loans will easily turn the scales in favour of the Soviets. This is especially true in the context of the foreign exchange crunch.

Meanwhile, one of the group's flagship companies JCT Ltd., plans to put up a Rs. 600 crore PTA plant in Punjab. It had already tied up with the Punjab State Industrial Development Corporation (PSIDC), and an application is expected to be made to the government for a letter of intent.

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IOC refineries at Paradeep, Karnal

The Indian Oil Corporation will set up two grassroot oil refineries of six million tonnes per annum each at Paradeep in Orissa and Karnal in Haryana.

Besides, the State-owned IOC plans to increase substantially, production capacity in the refineries at Barauni in Bihar, Haldia in West Bengal and in Assam and Gujarat to cope with the growing demand during the Eighth Plan, an official release said in New Delhi recently.

The proposed six-million-tonne refinery at Paradeep will be based on imported crude. After conducting detailed studies of the supply and demand position and infrastructural facilities, IOC has submitted a feasibility report on the grassroot refinery at Paradeep to the Ministry of Petroleum and Chemicals. It was now under the "active consideration" of the Government, the release said.

IOC was "actively pursuing" the six-million-tonne Karnal project, which is expected to help close the growing deficit of petroleum products in the north-west region.

Crude availability from the western on-shore in Gujarat is also expected to increase from about six million tonnes now to 9.7 million tonnes annually by 1994-95, according to the report of the sub-group of the Planning Commission on 'Exploration and production —Eighth five-year Plan'.

The organisation was considering low-cost expansion proposal of the Gujarat refinery by three million tonnes per annum to absorb the additional crude availability from the western onshore fields, the release further said.

Proposals for expansion of the refineries and setting up of the grassroot refineries have been included in the report of the subgroup on 'Refin
Eighth five year Plan'. The capac
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expected to go up to 7.2 million to
per annum by 1993-94 from the
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With the commissioning of the
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tonnes annually would be fully uti

The refining capacity in the ea
sector has always been adequate to
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north-eastern region. The expan
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capacity of the Mathura refinery
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The company has installed an auto
tic drum reconditioning plant, impo
from UK at Tarapur in Maharasht
few days ago. The new plant is a m
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which frequently led to unexpected
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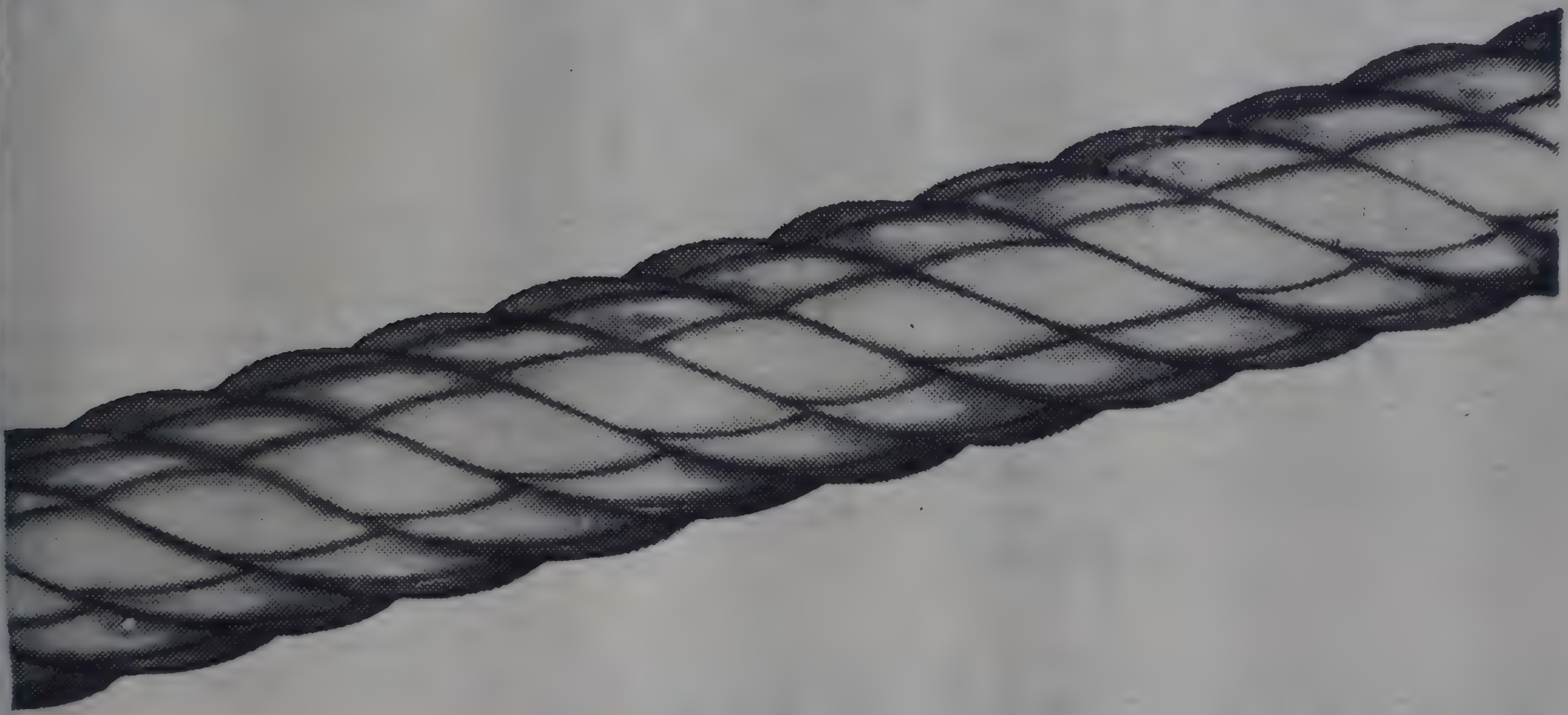

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SI Viscose bids for MPCL

South India Viscose Limited, Coimbatore, is interested in taking over the sick Madras Petroleum and Chemicals Limited (MPCL), now awaiting a revival package from the Board for Industrial and Financial Reconstruction (BIFR). At the first meeting convened by the Board in Delhi early last month, SI Viscose offered to present a detailed scheme within a month for acquiring MPCL.

The entry of the Coimbatore-based textile giant with a turnover of over Rs. 50 crores on the scene has surprised even financial institutions and banks. For, both the fund bodies and banks had taken it for granted that "MPCL" (formerly Naggan Ambadi Petroleum Refining) will be merged with the public sector Madras Refineries Ltd. (MRL) by virtue of the close links between the two companies.

The managing director of MPCL is a nominee of MRL. Moreover, it depends on the public sector company for the supply of certain feedstocks. MPCL is mainly engaged in the manufacture of transformer oil, white mineral oils and petroleum jelly. Its operations have suffered a setback from 1986-87. It owes a staggering Rs. 19 crores to the institutions and banks.

While applying to BIFR in August last year, MPCL mentioned that MRL would be an ideal choice for acquiring it. It explained that its viability could be restored by diversifying and taking up manufacture of some value-added products. Subsequently, in November, in anticipation of BIFR clearance for the merger, MRL and IDBI, the lead institution, signed an MoU for acquiring the assets of MPCL by MRL.

Now it appears that the public sector company will not have a cake-walk. A clear picture, however, is expected to emerge in th
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duty with a corresponding reduction of $12.30 million in contract payments, reflecting the estimated amount of customs duty. Saipem, however, also wanted ONGC to take the responsibility for customs clearance of imported goods which ONGC was not willing to bear.

It is now clear that the gas-lift pipeline network project will be delayed. According to the original schedule, the project was to be completed by December 1990. The scope of the contract would suggest that no company would be able to complete it within this time frame. The project scope includes design, engineering, procurement, fabrication, load-out, tie-down, transportation, installation, hook-up, testing and the pre-commissioning of 40 pipeline segments totalling about 180 pieces.

It also includes extension of pipeline risers and installation of valves on the well-head and process platforms. Certain modifications to the platforms' deck piping for pumping compressed gas to shore were also to be carried out as part of the project.

DECISION ASSURED ON MANGALORE REFINERY BY FEB. '90

The Centre has assured Karnataka that a final decision on the implementation of the Mangalore refinery and petrochemical project would be taken by February this year, according to the Karnataka chief minister, Mr. Veerendra Patil.

Mr. Patil said he had separate meetings with the Prime Minister Mr. V.P. Singh and the Petroleum and Chemicals Minister Mr. M.S. Gurupadaswamy. During the course of discussions they had given the assurance that the projects would be expeditiously cleared, he said.

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Stick to gas crackers

There is a lot of excitement in Calcutta about the Haldia petrochemical complex. For the first time in decades the country's biggest industrialists are vying with one another to invest thousands of crores of rupees in Haldia. Alas, neither the euphoria of Mr. Jyoti Basu nor the enthusiasm of the industrialists is justified at this stage. At a time when Plan resources and foreign exchange are in short supply, the Haldia petrochemical complex must be high in any economist's short-list of Eighth Plan proposals that should be axed.

For a start, the country needs only a limited amount of petrochemicals. The IPCL's gas cracker at Nagothane with a capacity of three lakh tonnes is virtually complete, and is being expanded to four lakh tonnes. Reliance has already been licensed for three lakh tonnes at Hazira, NOCIL has got the green signal to expand to three lakh tonnes and new public sector crackers of three lakh tonnes each are coming up at Gandhar and Auriya. In these circumstances there is simply no case for any more crackers at Haldia or Visakhapatnam. The last thing we need at a time of scarce resources is to invest thousands of crores in unwanted petrochemical capacity. It is better to err on the side of caution in such mega-investments.

West Bengal might argue that some of these gas-based crackers should be abandoned, and Haldia should be given priority. After all, say Bengalis, Haldia is conceptually one of the oldest projects. However, we must give preference to gas-based crackers, for we are already producing gas that is rich in the higher fractions suitable for cracking. This gas cannot be exported, and is currently being burned in boilers. This represents a scandalous waste of scarce resources that must cease. Naphtha is soon going to be in short supply in India and will have to be imported. There is no case for spending foreign exchange on imported naphtha when domestic substitutes are being burned. Indeed, apart from the gas-based crackers at Hazira, Gandhar and Auriya, we should have one in the north-east, where so much rich gas is being flared today. Chemicals from the Assam cracker should logically be sent to West Bengal for conversion into consumer goods. That will give far more employment to West Bengal than a cracker.

Assam is capable of supporting at least one cracker of three lakh tonnes capacity possibly two. Besides, gas production in Bombay High has risen very fast because of the increasing gas-oil-ratio. This means that much more associated gas (which is rich in the higher fractions suitable for cracking) is available than once expected. Engineers India Ltd. has found in a project report that if enough gas is available in the HBJ pipeline, a second cracker at Vijaynagar will be an excellent economic proposition. Again, offshore gas production from the Krishna-Godavari basin is rising, and may soon be able to sustain a cracker. In short, we probably have enough gas for cracking till the end of the century. Only after that should we consider naphtha-based crackers at places like Haldia and Visakhapatnam.

-- Financial Express

PROSPECTS BRIGHT FOR OIL RESERVES

The possibility of discovering additional oil reserves in the Cauvery basin is "very bright" according to Oil and Natural Gas Commission (ONGC) sources. The PY-3 discovery made in August and the four exploratory wells drilled since then have established oil reserves in the Cauvery basin to the extent of 22 million tonnes. Further exploratory drilling in and around the PY-3 structure is in progress the sources said.

A detailed scheme, estimated to cost over Rs. 235 crores has been prepared
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said. Modern science provided vast opportunities to the industry and they should make use of the existing national infrastructure, he added. Prof. Menon said the time was appropriate for the industry to highlight their inputs as a new Government has assumed charge. Industry was an extremely important component of development and it should carefully analyse its directions, he said.

Generation of more employment opportunities was very important and the industry should play a key role in this process. However, the exploitation of resources should be careful and it should keep in mind protection of the environment and energy conservation, he added.

Dr. A.P. Mitra, Director-General of the Council of Scientific and Industrial Research (CSIR), said the industry should make use of the infrastructure of high quality available with the CSIR laboratories. He said CSIR was taking steps to help the small-scale sector which did not have an in-house research and development facility.

Prof. Menon presented national awards for research and development to nine industrial establishments. The award winners were Bharat Heavy Electricals, Bhopal, Gujarat Communications and Electronics Ltd., Baroda, Ranbaxy Laboratories, New Delhi, Garware Plastics and Polyester, Bombay, Wipro Information Technology, Bangalore, Larsen and Toubro, Bombay, Steel Authority of India's Ranchi unit, Maharashtra Hybrid Seeds Company, Bombay and Lupin Laboratories, Bombay. The conference was jointly organised by the Department of Scientific and Industrial Research (DSIR) and the Confederation of Engineering Industry (CEI).

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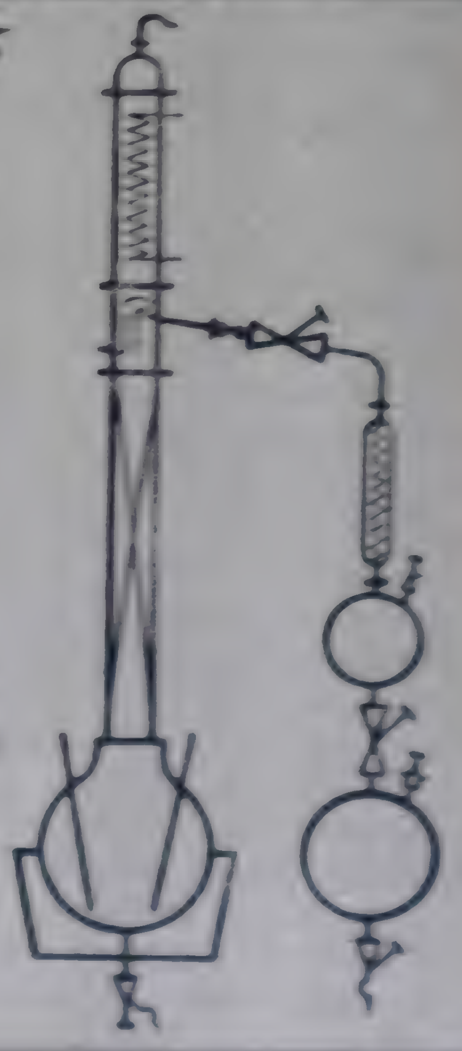

Plastic industry poised for unprecedented growth

Plastics are increasingly becoming synonymous with modern living. It has penetrated extensively into the common man's life. Plastic industry in the country is now being increasingly associated with the thrust areas of economic growth. It is pointed out that the demand for plastic goods has touched an all-time high of seven lakh tonnes rising from the low of 13,000 tonnes in 1960-61 and 87,000 tonnes in 1970-71 and four lakh tonnes in 1985.

The rapid growth in the consumption of plastics is attributed to its versatility as well as relative advantages in weight, processability, heat conductivity and non-toxic nature. Plastics is penetrating, and invading in all directions, be it automobiles, agriculture, pharmaceuticals, fertilisers and processed foods. Experts say, if the current trend of an average growth rate of 15 per cent is any indication, the consumption of plastics in India by the turn of the century is estimated at 25 lakh tonnes, which would imply a per capita per annum consumption of 2.16 kg.

As against this, the current level of per capita consumption is deplorably low at only 0.84 kg compared with world average of 14 kg. Hence, experts say, an enormous growth potential exists for expanding the use of plastics in the coming years. Plastics industry has come of age and has now attained national importance owing to its sheer growth and multifaceted applications. The industry had its humble beginning in the early fifties and presently the plastic raw materials sector is dominated by giant manufacturers like Indian Petrochemical Corporation Limited (IPCL), Polyolefins Industries Ltd. (PIL) and NOCIL etc. Still all the existing units are unable to meet the domestic demand and the country is forced to import at least half of its raw material requirements. On the other hand, processing sector is dominated by small-scale units, whose share is 85 per cent in number and 50 per cent in value of the products manufactured.

With an estimated investment of Rs. 2,500 crores in about 14,000 units, the plastic processing sector today provides direct employment to about six lakh people in the country. Moreover, the raw material sector plays an equally important role in the national economy by providing the necessary raw materials to the processing industry as well as generating income and employment to a large number of people.

Plastics has excellent export potentialities. However, the year 1987-88 witnessed the export of plastic goods worth Rs. 64 crores, against the target of Rs. 92 crores. It is pointed out that when compared to the potentialities of this sector, this is a negligible amount. The export of plastic products, which was Rs. 62 crores in 1980-81, has not shown the desirable growth rate. Rather the growth was highly erratic and most of the time below targets. For the year 1988-89, the target fixed by the industry is more than Rs. 100 crores. Experts point out that an industry, whose imports of raw materials cost the country an exchange outgo of Rs. 750 crores at present, should naturally try to export rather a higher amount than at present so as to compensate this loss.

Analysts say that if the past trend is any indication, great deal of effort is required to push up the current level of exports, which have been more or less stagnating for quite sometime. Morever, experts say, the import of plastic raw materials has become prohibitively expensive as the international prices have gone up by 160 per cent during the last 15 months. In such a situation, the current import of 3.41 lakh tonnes of raw materials has become a burden to the nation. It is also pointed out that since all kinds of processing machineries and skilled labour (at
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group comprised repre-
Department of Science
(DST), Directorate of Technical Development (DGTD), Central Road Research Institute (CRRI), Indian Petrochemicals Corporation Limited (IPCL), National Building Organisations (NBO) and the Plastic Processors Association (PPA). The group's objective is to consider the possibility of using plastic furniture in home and offices.

The working group has the following terms of reference: possibility of using plastic furniture in homes, offices and other areas; raw materials required to be used for plastic furniture; impact of using plastic furniture with regard to safety and inflammability; the cost of plastic furniture; feasibility of making plastic furniture in small and medium sectors; arrangements for marketing plastic furniture and the need to provide fiscal and financial incentives.

The working group has presented a perspective of growth in plastic furniture keeping in view its potential as a substitute for wood. In India, the group notes, plastic products have gained adequate consumer acceptance and the range is large enough to cater to the demands of different sectors. The group has observed that plastic furniture is costlier by about 20 per cent. If the differential impact of taxes and other levies are removed, plastic furniture would be comparable in price to wooden items. In fact, the working group has pointed out, in terms of total lifetime costs, plastic furniture is "more economical. The potential for plastic furniture is much more than its existing size."

In view of versatility of plastic, experts say, the plastic industry has to play a very vital role in the Indian economy. It is regarded as a sunrise industry as the future emphasis is bound to be on this industry. The government has already identified this industry as a thrust industry and has recognised the fact that plastics can substitute energy intensive materials such as glass, aluminium etc. and help in conserving natural resources such as water and wood. The plastic industry is now poised for an unprecedented growth in various sectors like telecommunications, potable water transport, rural health programme, educational aids, consumer and export packaging. In view of this, allout efforts should be made to encourage integrated development of this newly emerging industry.

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Plastindia '90

Plastindia '90, India's first international plastics exhibition and conference, will take place at Pragati Maidan, New Delhi in March 1990. It is being organised by the Plastindia Foundation in association with NOWEA International of Dusseldorf.

As India is currently on the threshold of the plastics age, it is expected to double consumption every five years. That is why the well-timed Plastindia '90 exhibition and conference has elicited such an overwhelming response. Over 350 exhibitors have already booked the entire floor space of about 20,000 sq. km. in Pragati Maidan, making it one of the biggest exhibitions of its kind in this part of the world.

Besides 185 regular exhibitors and 111 exhibitors from the small scale industry (SSI), nearly 60 foreign exhibitors from 15 countries will also participate. These include exhibitors from Austria, Belgium, China, France, FRG, Hong Kong, Italy, Saudi Arabia, Spain, Switzerland, Taiwan, the U.K., U.S.A., U.A.E. and Yugoslavia. Exhibitors from several other countries are also expected to participate.

Plastindia '90 will represent all segments of the plastics industry — raw materials, additives, processing equipment ancillaries, instruments/testing equipment, semifinished and finished products, industry associations, research/development/consultancy organisations and export promotion bodies.

An international plastics conference with the theme "Technologies for '90's" will be one of the highlights of Plastindia '90. Scheduled to be held in Pragati Maidan between March 3-6, 1990, this conference will have eminent personalities from all over the world presenting papers on state-of-the-art and emerging trends in the plastics indus Distinguished Indian and foreign tec nical experts will participate as de gates.

The Plastindia Foundation is publi ing a comprehensive directory to ser as a guide and reference for exhibito visitors and delegates. It will provi detailed information about the exhi tors — their products, equipment a services. Members of the plastics indu try can advertise their products and se vices in this Directory.

Plastindia '90 will exhibit a wi range of the latest polymers, blen alloys, composites and additive Modern processing equipment a ancillaries from India and abroad w also be exhibited.

Besides processors and large sca industries, Small Scale Industry (SS units from even remote areas like th north-east will display innovative pla tic products for industrial, agricultur and household applications.

Visitors to Plastindia '90 will get chance to interact with technical, ma keting and commercial experts from India and all over the world. This wi offer an ideal opportunity for membe of the plastics and plastics-related indu try to broaden horizons and explo export possibilities.

OIL SLICK NEAR MOROCCO THREATENS WORST DISASTE

A huge oil slick from a stricken Ira ian supertanker drifted closer to Moro co's Atlantic shore on January threatening one of the world's wors ever ecological disasters.

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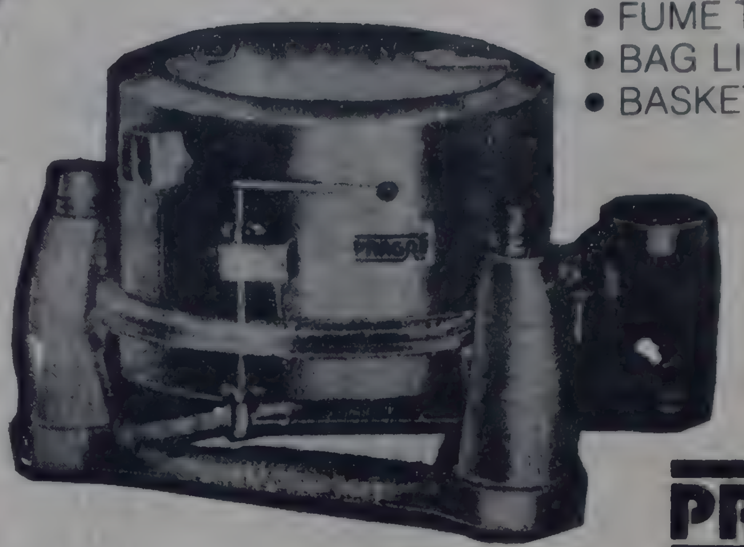

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Biotechnology & Life Sciences (Part 1)

NT GENETIC SYSTEMS EILS A NEW BREAK- OUGH IN HYBRID SEED DUCTION

ant Genetic Systems (PGS) of nt, Belgium last October announced w breakthrough in hybrid seed pro- ion. This breakthrough could lead ne creation of new and more effi- t hybrids.

Vorking in collaboration with Prof. ert Goldberg of the University of ifornia, the PGS has constructed and ressed a gene that prevents pollen elopment in crop plants, especially eseed oil. The result is a male ste- plant, an essential component in the ation of hybrid seed. Traditional hods for instilling male sterility in nts can be costly and inefficient, ms PGS.

The scientists report they have suc- ded in isolating a promoter that ws the expression, of a gene exclu- ely during the development of a nt's anthers (the male reproduction an). According to the research direc- Jan Leimans of PGS, this anther spe- c promoter has been used to express he plant a gene conferring male ste- ty. Through the promoter, a protein oded by the gene is expressed only ing the critical few days when pollen uld normally develop in the plant, pressing its production. The protein disappears after rendering the nt's male sterile, allowing it to con- ue normal development.

Apart from the economic significance rapeseed oil, which account for some o million hectares of plantation in rope, PGS claims the introduction of gene in only a small part of a plant r only a few days is 'unique in gen- c engineering'.

Further, the company claims that the new system is 'universal', except for cereals. Work is continuing on a wide range of crops from vegetables such as brussels sprouts, to soya bean and cotton. PGS hopes the new hybrids could be on the market by 1992.

Commenting on the development, Michael Renard, research director of France's Institut National de la Recherche Agronomique, said it not only represented a major technological breakthrough, but gives 'breeders great flexibility to create new hybrid varieties'. (*ECN*, 10/30/89, p. 24).

NEW BREAKTHROUGHS IN PLANT BIOTECHNOLOGY

Plant biotechnology looks increasingly promising as a new low-cost route to high-value products. Researchers at Morgan International (Netherlands) have succeeded in producing the pharmaceutical protein 'human serum albumin' (HSA) in potatoes. They claim it is the first time such a complex protein has been genetically engineered in a plant. The Morgan researchers have succeeded in expressing the human gene in the potato plant by replacing the human signal sequence with a plant-derived signal.

The purified albumin appears indistinguishable from HSA sourced from human blood plasma. The company has filed a patent application on the production method and is now teaming up with the Dutch potato starch processing concern, Avebe, to scale up to semi-technical production.

According to Dutch researchers, plant biotechnology has entered a phase when researchers can routinely express genes in plants. The technology can be applied to a whole range of pharmaceutical proteins, such as insulin and human growth hormone, and also those used in the food and detergent industries.

Further ahead in USA, scientists at the Research Institute of Scrupps Clinie, La Jolla, California, have introduced versions of mouse gamma and kappa immunoglobulin genes into tobacco cells. These have been cultivated into healthy plants, opening the possibility of an agricultural route to basic biotechnical building blocks.

Kappa and gamma immunoglobulins combine naturally to form antibody molecules. The Scripps researchers processes can cross plants containing the gamma gene with those containing the kappa gene to produce a plant that expresses both. The antibody represents 1.3% of the tobacco leaf protein.

Andrew Hiatt of Scripps recently explained that a commercialised process making antibodies as an agricultural product would find uses hitherto unavailable because of the high cost. Hiatt believes the cost of producing antibodies could fall from millions of dollars per kg to less than $100/kg. He further speculates that antibodies could be used in future for purification in industrial processes or as environmental detoxificants. (*ECN*, 11/6/89, p. 29).

A BIOTECH PROCESS FOR ERYTHRITOL ON THE HORIZON

Erythritol is almost as sweet as sucrose but with no calories and also has good heat stability and low hygroscopicity. Researchers at Nikken Chemical uncovered recently a microorganism capable of making erythritol $HOCH_2CH(OH)_2$. After mutation of Aureobasidium species, foaming characteristics were eliminated and a practical fermentation process was developed by using saturated glucose solutions (83.3%), which gave a 43-52% yield in batch or continuous mode and very low by-product levels. Erythritol has better flavour and bulking properties than aspartame and stevioside. The company also projects other uses in paints and resins for erythritol. (*Chem Brit.*, 1988 24 (12), 1186).

CUTTING GLADIOLI DOWN TO SIZE VIA TISSUE CULTURE

Israeli researchers have produced dwarf gladioli via tissue culture. Fields in Israel's Negev Desert are ablaze with dwarf gladioli. Scientists at Israel's Agricultural Research Organisation led by Dr. Anver Cohen, have recently developed a new strain of 'mini-gladioli' that is proving popular with flower lovers all over Israel. Though gladioli are decorative flowers, they are often unpopular because they are large and awkward to arrange in vases. Modern tissue culture cloning in Israel has produced a new gladioli, which is approximately half the length and thickness of the traditional flowers. (*News from Israel*, Oct. 1988, p. 14).

EMBRYOS ARE 'CHILDREN'

A judge in Tennessee in USA ruled last September that seven frozen embryos belong to their biological mother not the father. The court case is the first custody battle in USA involving eggs fertiliser outside the womb.

The case arose after the sperm donor Juniour Davis divorced Mary Davis, who had provided the eggs for in-vitro fertilisation. They were fertilised before the marriage was dissolved. The 'father' did not want the eggs to be implanted, while the mother did. The eggs have been stored at a fertility clinic, while the couple resolved the dispute in court.

The judge ruled that life begins at conception and that the embryo were not property but children that the mother should have the custody. Medical experts told the court that the embryo at the time of freezing consisted of four to eight cells each. (*New Sc.*, 9/30/89, p. 23).

BIOLUMINESCENCE EMERGES AS A MONITOR OF GENETIC ACTIVITY

Bioluminescence is emerging as a novel means to monitor genetic activity. Two years ago, researchers at the University of California (San Diego) introduced the gene for luciferase, the enzyme responsible for a firefly's glow, into tobacco plants. The same researchers have now taken genes for four other bioluminescent enzymes, each catalysing a different coloured luminescence and successfully transplanted them into bacteria. Depending upon the gene, the bacteria can glow green, yellow, orange or yellow-green.

A luminescence enzyme becomes a marker for genetic activity when its gene is coupled to another gene of interest. Expression of the latter gene also triggers the production of enzyme. Addition of luciferin, which reacts with oxygen in the presence of ATP and luciferase type enzyme, generates the chemical light. Because the new enzymes differ in their emission spectra, it would be possible to monitor several genes in this manner. Bioluminescence also can be used to track cells or genetically modified organisms.

The four marker genes were taken from the Jamaican click beetle, a firefly that relatively emits light from an organ on the abdomen and a pair of organs on top of the head. Biologist William McElaroy and the late biochemist Marlene Deluca began studying the beetle 30 years ago. 'We measured the light with a spectrometer for the first time and found that the beetle emitted five or six different wavelengths light', said McElroy.

With the advent of the new genetic techniques, McElroy and chemists Kei Wood and Y. Lam along with biologi Howard Selinger from Johns Hopkin University, succeeded on isolating an sequencing the genes. They found th four genes to be 95% to 99% homologues with each other, but reflectin evolutionary distance, only around 50 homologous with firefly lucifera (*Anal Chem*, 7/15/89 p. 833-834).

A NEW BIMONTHLY PUBLICATION 'BIOTECH PRODUCTS INTERNATIONAL'

The year 1989 saw the publication o bimonthly called Biotech Product International. It is published by Pa European Publishing Co. (a division o Elsevier Librico NJ.), Iue Verte 216 1210 Brussels, Belgium. It is publishe six times a year, Jan/Feb, March/April, May/June, July/Aug, Sep/Oct, Nov/Dec.

Designed on a broad-based produc information source for bioscientists and bioengineers, this new journal wil review the latest product developments relevant to the various fields of life science research and bioindustry.

CHEMISTRY NOBEL PRIZE FOR RESEARCH ON RIBONUCLEIC ACID (RNA)

One of the established rules o molecular biology — until this 1989 Nobel Prize winners Sidney Altman and Thomas Cech came along — was that cellular catalysts were always proteins, made of amino acids. But the above scientists showed that nucleic acids, as well as proteins, can act as catalysts.

Ribonucleic acid (RNA) ferries instructions from genes to ribosomes t make proteins. To create the RNA in the first place, the double helix of deoxyribonucleic acid (DNA) that makes up the genes unwind. One DNA strand acts as a template to assemble and link up a string of ribonucleotides, formin RNA.

stretches of the DNA are use- naking proteins, thus, some of y formed RNA is also, and gments must be edited out e RNA can go on to create pro- ke many other chemical pro- a cell, that editing also requires st. The prize winning research RNA itself can act as the cat-

University, where Altman is a professor, notes the two scien- ork suggests that primitive cells nave used RNA instead of pro- regulate themselves.

nan does not foresee any immed- plications for the discovery, but yal Swedish Academy of Scien- hich awards the Nobels, believe ic RNA could be designed to act he shears to destroy RNA mol- that produce harmful or undesir- roperties in organisms. (*Chem* 0/25/89, p. 14).

TU PROCESS DEVELOPED IODEGRADE TRICHLORO- LENE

hloroethylene present in ground- can be biodegraded by an in-situ s, according to field trials — just eted by Ecova Corp. (Redmond, ngton). In the five day test by the management company, the pro- chieved the reduction of trichlo- lene in-situ from a high 3000 ppb s than 100 ppb.

programme involved proprietary ss for introducing nutrients, n and naturally occuring bacteria he sub-surface. It is based on iso- by Ecova's researcher Michael n of the trichloroethylene bacteria entification of a non-toxic inducer to stimulate the microbial activity.

Citing the test results as an advancement over conventional processes, such as air-stripping are carbon adsorption, Ecova's project manager John Kinsella reports, 'the rapid degradation rates will allow us to move forward to rapid site cleanup that will result in reduced remediation costs for the client'. (*C & EN*, 10/2/89, p. 18).

RECENT STUDY IN USA FORESEES NEW APPLICATIONS OF ENZYMES IN SEVERAL FIELDS

The US market for applications for enzymes, now at $266 million/year will grow 7% per year for the next five years, according to a study by management consulting firm Strategic Technologies International (STI, Mundelein IL). The study 'Enzymatic Syntheses; Technical Advances & Commercial Prospects' notes that current applications for enzymes include food processing, detergents and the manufacture of semi-synthetic antibiotics, but STI sees promise in synthesising products such as beta-blockers, non-steroidal anti-inflammatory drugs, bioadhesives and herbicides.

Lastly, in the oils and fats industry, use of lipases to split triglycerides and make synthetic cocoa butter should 'find wide use in the next few years', STI says, to the tune of $40 million in the USA. (*Chem Wk.*, 11/1/89, p. 25).

L-CYSTINE AND L-TYROSINE TO BE PRODUCED FROM HUMAN HAIR IN INDIA

L-tyrosine and L-cystine amino acids are to be produced from human hair in India. The technology from Japan for the production of these amino acids has been procured by an Indian company Protchem Industries (India) Ltd. A Rs. 123 million, 100 per cent export oriented project to produce the above two amino acids is coming up in a village Abishekapakkam near Pondicherry.

It is proposed to manufacture 1400 tonnes/year of amino acid powder, 84 tonnes/year of L-cystine and 24 tonnes/-year of L-tyrosine. The products will be exported to Japan as part of the buy back guarantee for eight years.

The proprietary process produces amino acids by treating human hair with HCl and then treated with caustic alkali and soda ash. After various steps covering filtration and pH adjustments, electrical drying, the process obtains pure L-cystine and L-tyrosine.

A unique feature of the technology is that the disposable effluent is not wasted but treated to a complex process to produce amino acid powder containing as many as 19 amino acids. (*PTI Science Service*, 8 (7), 1989, 1).

CURRENT THEORIES ON CHEMICAL PROCESSES CAUSING DESTRUCTION OF THE EARTH'S OZONE LAYER UNDER SCRUTINY

Government researchers in USA report recent experiments cast doubt on widely accepted theories about the chemical processes causing destruction of the earth's ozone layer. The scientists say currently recognised chemical reactions involving chlorine and bromine cannot explain all the ozone loss that occurs over the Antarctic during the region's springtime. The chlorine bromine reaction accounts for less than one-half of the loss they explained. (*CMR*, 9/18/89, p. 7).

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Food & Pharmaceutical Technology in Perspective (Part 1)

PHAGE VIRUS ED TO PROTECT

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if phages are added during
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e of the cheese and can attack
a infects the product.

mpany hopes to have listeri-
rus commercially available in
0s after trials. (*Food Manuf.*,
p. 16).

TYPE OF SEADLESS ON THE HORIZON

may join apples and oranges
d lunches. A plant breeder in
on, South Carolina has deve-
w varieties of melon that are the
lums and can be eaten skin and

Mugent, a researcher at the US
ent of Agriculture's Vegetable
ory has been active in research
87 to find new melons for the
nt market for 'snack' fruit, where apples, citrus fruits, peaches and plums dominate. His goal is a hybrid bred from wild melons that have been crossed with cantoloupe or honeydew melons.

The ideal melon will be bright yellow, it will have orange or green flesh and a thin edible skin. The melon will also be seedless and have a long shelf-life. However, it will be atleast two years of research before such melons can be produced in the fields.

One of his plants now yields between 6 and 15 grapefruit sized melons per vine, with flesh that is firm and sweet but off-white in colour. So far researchers have crossed commercial varieties of cantaloupes and other melons with wild plants, whose fruit is about the size of an egg. Unfortunately, these tiny wild melons are not very sweet and their aroma is odd.

The greatest challenge to researchers will be to make the melons seedless. As the researchers reduced the size of the melons, the size of the seeds did not go down as fast as the rest of the fruit. Therefore, researchers will have to try a new approach for obtaining seedless melons. (*New Science*, 8/19/89, p. 32).

TAKING THE CHOLESTEROL OUT OF DAIRY GOODS

Lowering cholesterol levels in foods is now possible. Researchers at Cornell University and the Food Research Society in Japan working independently, have developed practical methods for supercritical fluid extraction of cholesterol from milk.

What makes the Cornell process particularly exciting is that it not only reduces cholesterol by 90% but also recovers up to 88% of decholesterolized butter fat. Returning the decholesterolized butter fat to skimmed milk opens the door for a host of low cholesterol dairy products including butter, cheese, ice cream and of course, milk.

To obtain the decholesterolized fat, the Cornell group injects CO_2 at 40°C and pressure as high as 4000 psi, into butterfat. The supercritical CO_2 removes cholesterol along with some triglycerides and carries it into a second unit, when changes in pressure and temperature help to selectivity precipitate the cholesterol.

In a third unit, the pressure drops to atmospheric level, and the now gaseous CO_2 dissipates, leaving the triglycerides behind to be restored to the butterfat.

The Japanese approach is similar and an 84% reduction in cholesterol and 80°C recovery of butterfat have been reported. Both procedures borrow from the commercial methods for supercritical fluid extraction of caffeine from coffee and in beer's characteristic bitter flavour from hops.

Dairy producers hope that lowering cholesterol will boost milk sales in USA, Western Europe and Japan. (*Anal Chem*, 5/1/89, p. 588 A).

A NEW TECHNOLOGY TURNS POTATO WASTE INTO BIODEGRADABLE PLASTICS VIA ACID

A new process that biologically converts food processing waste into lactic acid and then uses the lactic acid to make environmentally safe, bio- and photo-degradable plastics was developed at Argonne National Laboratory (Argonne, Ill, USA).

In the new route starch (from such sources as potato-waste or cheese whey) is enzymatically hydrolyzed to glucose.

The glucose and other hydrolysis products are subsequently fermented by bacteria (L. lactis) that produce lactic acid which is continuously recovered, concentrated and further purified into a polymer grade product.

Few, if any of the degradable plastics currently available, including plastics containing starch, degrade to innocuous compounds, have suitable physical and mechanical properties and are cost effective.

On the other hand polymers and copolymers made from lactic acid have excellent mechanical properties and degradability and the availability of low cost feedstock and cost effective bioconversion and recovery processes should stimulate the use of lactic acid in making bio - and photo -degradable plastics. (*Chem Eng*., 9/1989, p. 19).

FRUIT AND VEGETABLE PRESERVATION BY COATING OF NATURAL YEAST DEVELOPED BY ISRAELI RESEARCHERS

Israel has developed an expanding fruit and vegetable export business to Europe. It supplies fruits and vegetables during winter months to Europe in a big way. This export business required modern fruit and vegetable preservation acceptable to choosy educated European buyers. Now, scientists at Israel's Agricultural Research Organization (ARO) near Tel Aviv have isolated a form of natural yeast that occurs in nature on the skin of citrus fruit, protecting it against fungi. The yeast has already been produced in large quantities, patented and successfully applied to a consignment of tomatoes and cucumbers exported to Europe.

Israeli experiments show that 96% of produce stays fresh after treatment with this yeast, reports Dr. Edo Chalutz of the ARO Institute for Technology and Storage of Agricultural Products. The yeast does not affect taste and as it occurs in large quantities in certain cheeses.

Dr. Chalutz envisages a situation whereby a dipping coating process is built into all fruit and vegetables pacing stations. Israel also hopes to sell laboratory made yeast to farmers in Africa and America who export their fresh winter produce to Europe. (*News From Israel*, 10/1989, p. 15).

A NEW PROCESS CLAIMS TO PROVIDE FRESH CRISP CANNED VEGETABLES IN FUTURE

A food chemist in USA has patented a method of canning in which vegetables stay as firm and crisp as the garden fresh vegetables. Malcolm Bourne, a professor of food science and technology at Cornell University, New York, has recently identified an enzyme which reverses the process that makes the canned vegetables soft and mushy. He also discovered that reducing the temperature during the blanching stage of the canning procedure, stimulates the activity of this enzyme. He is confident that once the researchers find a way to eliminate the microorganisms that survive the lower temperature, tinned vegetables will be fresher than frozen ones.

In normal canning, vegetables are blanched for a short time in boiling water simply to drive out gases so that they can pack more vegetables in the can. The vegetables are then heated in the container to sterilise them -- from microorganisms that cause botulism.

Suspecting that the vegetables lose their crispness during the blanching, researchers investigated the chemistry that makes them mushy. They found that heat breaks down the large pectin polymers which are responsible for firmness and crispness in fresh vegetables. They also discovered that pectin methyl esterase, an enzyme which exists in all plant tissues, could reverse the softening effects of cooking. This enzyme is able to build salt bridges out
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Bourne also found, h
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GENETICALLY ALTE
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Dennis Gonsalves, a pla
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which has already been co
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EVICE TO DELIVER MEASURE BLOOD EVEL

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m pen can be carried dis- bag or briefcase. One can and give oneself an injec- anyone knowing it, reports ood, Senior Medical Direc- betic Treatment Centre of California, where the pen was developed.

Many physicians believe simplifying injections can improve insulin-dependent patients' willingness to manage the disease, leading to better control of the disease. Diabetes, when uncontrolled, can lead to blindness, and kidney and heart disease.

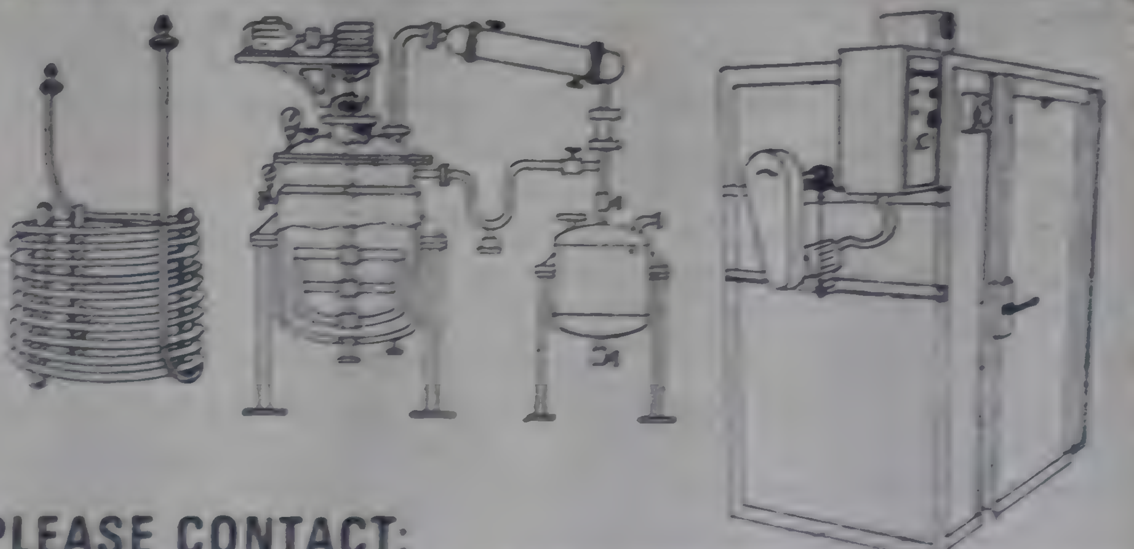
The pen costs about $40 in USA and is available in the market in USA. Another pen-sized device measures blood-glucose levels. It is easy to use and gives results within 30 seconds. (*Los Angeles Daily News*).

VITAMIN A LINKED TO LIVER DAMAGE IN THE ELDERLY

Recent research of Dr. S. D. Drasinki and his co-workers point out that although Vitamin A deficiency is uncommon in effluent countries like USA and Western Europe, many nevertheless, take supplement of this vitamin, usually in a multivitamin preparation. A survey undertaken by the above researchers indicated some liver damage particularly in the elderly. They therefore, recommend that elderly people should limit their intake of supplemental Vitamin A, particularly over long term, to avoid overload and possible liver damage. Perhaps, the margin of safety for Vitamin A intake is lower in the elderly. (*Amer J. Chemical Nutrition*, 1989, 49 (1)).

THE HEALING TOUCH OF SILVER

Metallic silver chemically bonded to the material used to make surgical sutures seems to inhibit infection and speed the healing of wounds, according to recent research at Cornell University (Ithaca, N.Y.). When a few microamps of electricity are passed through sutures, silver ions are released and act as an antibiotic, researchers report. The pro-



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ject now awaits a grant from the National Institute of Health (USA) for testing in mice. (*Chem Wk.*, 10/9/89, p. 26)

RESEARCH ON PHYSIOLOGY OF HIBERNATING BEAR FUNDED TO DEVELOP FUTURE TREATMENT OF KIDNEY FAILURE AND BONE LOSS

Biochemists suspect that hidden in the black bear's physiology during hibernation may provide clues for curing kidney failure and bone loss in humans.

Black bears hibernate in winter for as long as 5 months. During that period they do not eat, drink, urinate or defecate. Its heart rate during hibernation is about 8 compared with a normal sleeping rate of 40. The body temperature is about 9°F below the normal 100°F. Further, studies have shown that hibernating bears do not lose calcium from their skeleton when hibernating. In contrast bones of mammals who are not constantly fighting gravity tend to weaken from calcium loss and osteoporosis. Examples are bed-ridden patients and astronauts.

Researchers therefore, believe that some as yet unknown regulatory substance must be preserving inactive bears from this problem during hibernation. Perhaps in future researchers will be able to isolate this active substance from bears.

Researchers at the Carle Foundation Bear Research Centre, (near Champaign, Illinois USA) have found that a hibernating bear burns mainly fat, thus minimizing the build up of the toxic urea produced when protein is metabolised. This urea produced is broken down and the nitrogen recycled to protein synthesis. Because the bear does not urinate, it needs only enough water to replace that loss during breathing, that amount is supplied by the breakdown of fat. The researchers idea is to ape the hibernating bear's metabolic efficiency and so reduce the amou
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Science Briefs

SAFETY STUDY

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SACHTLEBEN OPENS WASTE ACID UNIT

Titanium dioxide producer Sachtleben Chemie has started up a DM200m ($108m)plant to recycle spent acid at its Duisburg site. The start-up marks the end of dumping spent acid from West Germany into the North Sea.

The 800,000 ton/year plant will treat waste from Sachtleben's titanium dioxide production facility at Duisburg and also from pigment manufacturer Kronos Titan of Leverkusen. Waste acid will be concentrated and returned to the production cycle.

The plant was designed and constructed by Lurgi using Bayer technology.

Commissioning of a recycling unit will allow Sachtleben to expend production capacity. From late 1990 the company will be able to supply 85,000 ton/year of titanium dioxide, an increase of around 35 per cent.

An EC ruling in June called for a ban on the dumping of waste acid into the North Sea from the end of 1989. Certain European nations, however, are to be permitted to continue, in some cases up to 1993.

KEMIRA INVESTS IN TIO_2 R & D FACILITIES

Finland's Kemira Oy is investing FM36m ($8.4m) in a new pilot plant facility and laboratory extention at its Vuorikemia titanium dioxide plant in Pori.

The pilot facility will be used to test titanium dioxide and pearl lustre pigments and production methods, with emphasis on environmental protection. The laboratory extension is to meet a growing requirement for product research and application tests.

Development director Kari Karki said the company has a range of products at the developmental stage, but declined to give details.

Work on the pilot plant and laboratory extension is due for completion mid-1990. An announcement on the engineering contractor is expected shortly.

UK AND YUGOSLAVIA TO COLLABORATE ON WIND ENERGY

UK and Yugoslavian wind energy experts have been discussing ways of promoting industrial collaboration between the two countries.

The talks, which took place during a two-day seminar at the National Engineering Laboratory in East Kilbride, were held as part of the UK-Yugoslavian agreement on science and technology.

The Yugoslavian party is in the UK on a fact-finding trip organised jointly by the National Wind Turbine Centre and the Department of Trade and Industry. It is hoped that private talks between the delegation and UK manufacturers will lead to sales for British companies.

Other venues on the tour included NEL's test site at Eaglesham, wind turbine installations on the Orkney Isles and the Central Electricity Board's facility at Carmarthen Bay in South Wales.

FLUIDISED BED CUTS PRODUCTION FLOW COSTS

British United Shoe Machinery has replaced its existing heat treatment facilities with a £40,000 fluidised bed furnace, resulting in annual fuel cost savings of £11,500 and a payback in less than three and a half years. It is one of outstanding entries in East Midlands Electricity's PEP (Power for Efficiency and Productivity) awards competition. The Leicester factory's heat treatment process was formerly a batch sealed quench furnace and a neutral salt bath. The heat treatment plant was composed of quenching equipment, water cooling jackets, oil heaters and coolers, atmospheric and oil agitation fans and an automatic sequencing system. With so many functions involved in the process, maintenance and repair costs were high and excessive down time was suffered due to breakdown.

Operating on gas and electricity, the quench furnace and salt bath incurred running costs of £15,500 per annum. The two units were replaced by a 45kW fluidised bed supplied by Rosin Engineering of Stourbridge. Besides having drastically cut running costs, the change has provided lower unit production and maintenance costs, reduced processing time, permitting increased output and the ability to meet 'just-in-time' production requirements as a result of the equipment's flexibility in operation.

In addition, the removal of an awkward production bottleneck has improved working relationships between manufacturing departments.

COMPOSITE CERAMICS WITH ALUMINA SILICON CARBIDE

Hitachi Metals Ltd. in Japan has established a manufacturing process for alumina-silicon carbide whisker composite ceramic which shows 95 per cent sintered density by a normal sintering method.

Alumina-silicon carbide composite ceramics have been studied intensively as a high toughness material. Hitachi has studied the optimum manufacturing process with the object of achieving a high density by a normal sintering method.

Alumina powders and silicon carbide whiskers are dispersed in 4 per cent polyethylene imine aqueous solution and are wet pressed in the experiment. By this, the shrinkage in the pressing direction at the sintering has been improved giving a better sintering density. A mixture of 85 per cent alumina and 15 per cent silicon carbide whisker is sintered at 1725 degrees C and 95 per cent of sintered density has been realized.

The sintered density strongly depends on the length distribution of the whisker used and the shrinkage in the thickness direction at the sintering is almost constant up to about 10μm. Composite ceramics for engine parts will be sintered at a high density in a practical shape by this process.

-- P.T.I. Science Service,
December 16-31, 1989

WATERJET THAT SLICES STEEL

A contraption from which a needle-thin stream of water moves thorugh a slab of carbon steel and slices it cleanly and quickly into half has been developed at the University of Rhode Islands in the United States. The high-tech knife carves up hard ceramics on which even diamond-tipped saws bounce off without making a scratch.

A laboratory at the University took but a minute to make a 1.4-inch-long slice in an inch-thick zinc-nickel-steel composite. In comparision, electro-discharge machining, a widely used way to make fast and clean cuts, goes through only a tenth of an inch, the journal said. Waterjets zip thorugh inch-thick pieces of aluminium at a rate of four inches per minute. While lasers don't cut transparent materials, waterjets dissect a foot-and-a-half of inch-thick glass in a minute, it said.

In fact, a waterjet can cut any material without heating it and without the distortion that charactarizes many other cutting methods. And this knife releases no toxic dust and needs no sharpening. The water stream captures all the dust, which is then filtered out in a collection tank, it said. Though waterjets have been around since the
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-- P.T.I. Scie
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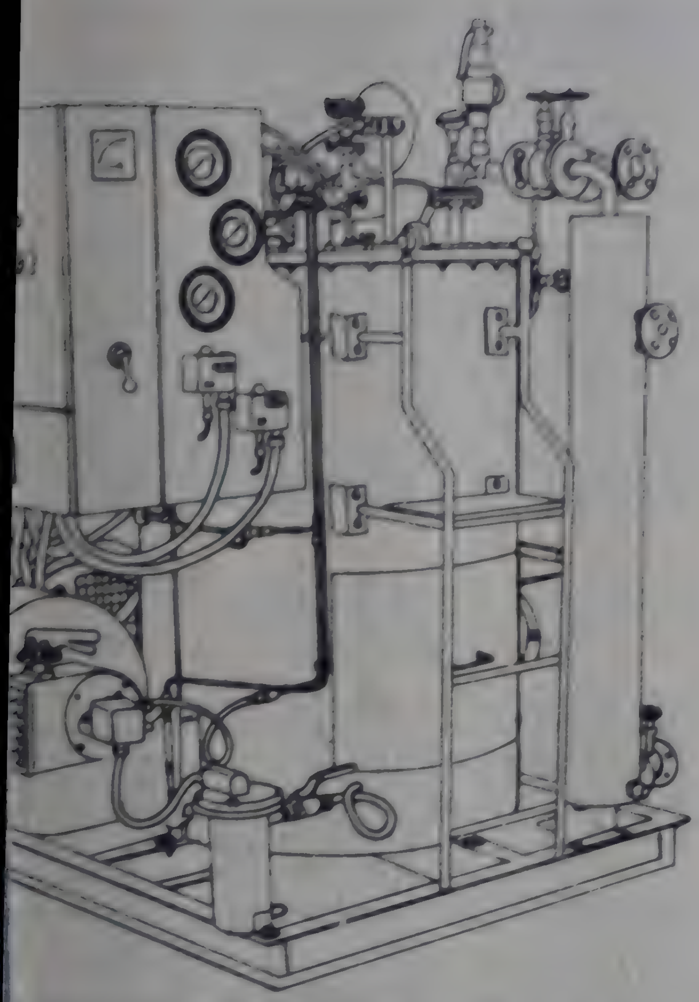

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Pollution abatement for small paper mills — Problems and prospects*

T.S. VENKATARAMAN,
President, Esvin Advanced Technologies Limited, Esvin House, Perungudi, Madras 600 096.

ll paper mills cover nearly 50% of total installed or paper and boards in India. However, they are responsible for contributing to 75% of total pol- d discharged by the paper industry. The principal this situation is non-availability of a commercially emical recovery system. The twin constraints in such a system are

hemical pulping capacity; and
straw as primary raw material.

led techno-economic evaluation has been made of tential treatment options targeted to meet the string- nt standards, while leading to chemical recovery/ nservation. A review of emerging technologies and ct on pollution abatement in small paper mills as g mills is presented.

tion

liferation of small paper mills (capacity less than) in the last two decades has substantially contri- e growth of paper production in India. Today some ave expanded their capacities upto 24,000 tpa and nearly 50% of present total installed capacity of n tonnes per annum. While it is comforting to rec- t these small paper mills have achieved this distinc- ut affecting the Indian forest ecosystem, as they y agrifibres and recycled fibres, it is very disturbing that these small and medium paper mills discharge uents with pollution loads nearly three times the pollution load of all big mills.

ncipal reason for this malaise is the non-availability rcially viable chemical recovery system for these ling to draining of more than 36,000 tpa of recov- stic and the resultant wastage of 90 million units electric power. With the strict enforcement of pol- ndards by various environmental/pollution control any of these mills are under threat of imminent clo- cting to this alarming situation, the financial insti- d Government of India (GOI) who have given ncial assistance to these mills, are promoting deve- work on identification and demonstration of viable recovery systems for these mills. The author was principally involved in one such feasibility study, undertaken two years ago at the request of the Industrial Credit and Investment Corporation of India Limited.

The pollution problem of small paper mills due to the twin constraints of size and use of agro-wastes is also relevant to big paper mills, as they are being compelled to augment, their raw material sources through adoption of small agro-based pulping line. Further the newsprint mills have also to address pollution problems of similar nature arising from CTMP/CMP pulping sections. Therefore, critical review of the various options available and identification of suitable commercially viable system for abatement of pollution from small paper mills assume a wider perspective and urgency than it did ever before.

Magnitude of pollution problems of small paper mills

To bridge the gap in demand and supply, Government of India encouraged in the Seventies, the establishment of small paper mills based on unconventional raw materials. The growth in small paper mills during the last two decades, categorywise is given in Table 1. All paper mills less than 10,000 tpa were defined initially as small paper mills and received concessions and fiscal incentives from Government and financial institutions. These mills were based on agricultural residues and recycled fibres without any chemical recovery. According to a notification issued by the Ministry of Industry in 1984, the small paper mills based on unconventional raw materials had been redefined to include mills of installed capacity upto 24,000 tpa and also not having a plant attached thereto for making bamboo and wood pulp. Since then, many small mills of capacity 10,000 tpa have expanded upto 24,000 tpa. Therefore the definition of small paper mills for the present paper includes all categories including a few in category I (above 20,000 tpa).

However, by about this time, the financial institutions took a policy decision not to fund in future any small paper mill if it was based on chemical pulp manufacturing without a chemical recovery system. The quantum of chemical produced by these small mills varies from nearly 100% to as low as 5% in some mills. The balance raw material furnish consists of waste paper and imported pulp. The pollution loads due to waste paper and imported pulp are insignificant compared to the load arising out of use of chemical pulp without chemical recovery. The pollution load from agro-based small paper mills, due to absence of chemical recovery, is about three times in terms of BOD and COD and about four times

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sented at CESE-IIT Bombay State-of-the-art Symposium on Options — Sugar, Distillery, Paper and Allied Industries, -8. 1989.

Table 1
Trend in category-wise growth of paper mills

Category	1951	1961	1971	1981	1989	Install (tonn (As o
I	2	6	14	22	30	
II	3	4	3	9	24	
III	2	3	7	31	87	
IV	5	8	12	33	107	
V	5	6	10	41	57	
Total	17	27	46	136	305	

Source: DGTD
Note:
Category: I Above 20,000 tpa
II 10,000 to 20,000 tpa
III 5,000 to 10,000 tpa
IV 2,000 to 5,000 tpa
V Below 2,000 tpa

in terms of lignin compared to big mills. The comparative pollution loads are furnished in Table 2.

Recognising the problems and financial constraints of small paper mills and based on NEERI's comprehensive document for small paper industry, Central Pollution Control Board has evolved Minimal National Standards (MINAS) for discharge of waste waters for small paper mills. The standards of IS and MINAS and the characteristics of effluents discharged by big and small mills are furnished in Table 3. It can be seen from these standards that no limit for sodium content or colour has been set and in MINAS even COD limit has not been specified. Due to absence of chemical recovery, these small mills cannot meet any of these standards and they discharge the effluent after some primary treatment into land for irrigational purposes.

Because of the growing problems of l
concerns raised on the possible increase
soil, the small paper mills are under gre
treat their effluents. The MINAS limits h
by all small paper mills sooner otherwis
face threat of closure.

Besides pollution loads, the magnitud
and the corresponding electrical power w
iated from the following estimates:

1. Total agro-based raw materials consu
   mills (2) - 400,000 tpa.
2. Caustic consumed at an average of 1
   - 48,000 tpa.
3. Recoverable caustic @ 75% recovery
   tpa.
4. Electrical power required to generate
   Kwh/t - 90 mil. units.

In addition to above the lignin discha
not only results in wastage of energy in te
but also leads to colour load of 1400-1

Table 2
Pollution load from paper mills
Based on actual production in 1988 (1,2)

Description	Big paper mills	Small paper mills	Total
Number of paper mills	30	275	305
Installed capacity (m. tpa)	1.46(48)	1.54(52)	3.00
Actual production (m. tpa)	0.83	0.88	1.71
Suspended solids (tpd)	298(48)	328(52)	626
BOD@20°C (tpd)	115(25)	350(75)	465
COD (tpd)	493(25)	1467(75)	1960
Lignin (tpd)	65(19)	275(81)	340

Figures in parentheses are percentage values. It is assumed that the actual production is 57% of the installed capacity in bo

Table 3
Characteristics of effluents and standards (1)

	IS-2490 (1974)	Big mills	Small mills (agro-based)	MINAS
	5.5-9.0	6.0-9.0	6.0-8.5	6.0-9.0
(mg/l)	100 (max)	300-450	400-1100	100
/l)	30 (max)	100-160	220-1100	50
	250 (max)	500-700	2000-4800	--
	--	80-100	300-700	--

s been estimated that 90% of the colour is though there is no stringent legislation for colour by Central Pollution Agency, some osed tolerance limits in this regard.

lopting conventional chemical recovery

ize

small paper mills are operating at capacity tpa, the chemical pulp produced out of agro-nals exceeds 10,000 tpa only in few mills. nt survey (2), it is observed that only about oducing chemical pulp in excess of 30 tpd. y well documented by various authors (3,4) l chemical recovery system, based on roaster/ able or only marginally viable even for chem-ity of 30 tpd, the principal reason being that (steam + power) is more than 80% of oper-uding interest and depreciation). But a more modern chemical recovery system (normally elf sustained in energy) is also not economi- to the high capital cost involved. This means proach will not help to save the energy lost el value in organics and electrical power in effluent discharged by these mills, though pol-ls can be met. In fact one of the small paper chemical pulping capacity did install recently m (without heat recovery) and had to shut it ow energy efficiency.

onstraints

cipal raw materials used by small mills are se. While limitations of size applies to both case of straw the problems of viscosity and ew dimension to the problem of chemical ould be clearly understood that desilication of k liquor (when it is commercially proven) may nical for small mills of even 30 tpd capacity. e are now more straw based pulp mills of capac- 30 tpd than bagasse based mills and there is od of such mills proliferating. Silica is not the only problem of straw based liquors — rice, straw liquors have higher viscosity and are colloidally unstable at concentrations above 30% (5) and, therefore, conventional evaporation and combustion of spent liquor are beset with problems that are too difficult for small mills to cope with.

Process technology deficiencies

Since the small mills were conceptually designed for low capital cost, many of them were implemented with inadequate process technology as enumerated hereunder:

- The raw material preparation in terms of efficient depithing of bagasse or wet cleaning of straw, is not adopted or technically inadequate in almost all small mills;
- All mills excepting one or two use batch rotary/tumbling digesters and this results in low concentration of spent liquor due to high bath ratio maintained in cooking or due to one stage washing in digester;
- More significantly, many small mills have only two stage pulp washing and a few use only single stage. Due to poor raw material preparation, the washing efficiency is low inspite of using high wash water, leading to further lowering of spent liquor concentration. It may be appreciated that brown stock washing stage plays an important role and hence forms critical part of chemical recovery system.

All the above process deficiencies need to be addressed and the resultant increase in capital costs has to be factored into while planning for a chemical recovery system for these mills.

Review of alternatives to conventional chemical recovery

Any alternative technology or process route should therefore evolve around features that reduce energy cost and/or capital cost as these two are, as discussed earlier, principal factors influencing economic viability.

DARS - Ferrite recovery process

This system was developed basically with a view to conserve fuel energy used in reburning of lime (where silica is not a contaminant), and save capital cost in respect of causticising. The details of the first commercial installation of DARS plant for wheat/rye straw mill of 50,000 tpd in Denmark has been recently reported (6). The accumulation of silica in ferric oxide loop is controlled by continuous purge of the finest dust fraction. Kulkarni et al (7) have carried out detailed experimental work to show that ferrite can be recycled even for bagasse black liquor upto six cycles. It is to be expected that for rice straw liquor, which has a substantially higher silica content, the number of cycles will be significantly lower. Further, since the organics to inorganic ratio drops down after each cycle, its implications on combustion problems and requirement of auxiliary fuel are yet to be evaluated. The capital cost is claimed to be lower by 30% due to elimination of causticising section but until the system is proven for silica rich liquor and the attendant capital cost increase is assessed, DARS is not yet an alternative to chemical recovery system for straw-based mills, though it may hold better prospect for bagasse based mills of 30 tpd and above.

Wet cracking system

Wet cracking system developed in People's Republic of China seems to be an interesting option, though it is a modified version of wet air oxidation process. From the detailed presentation of this process by Tan Long (8), it seems the feed black liquor concentration can be as low as 10%, which is indeed very ideal since this can eliminate multiple effect evaporators, as rice straw liquor with good washing system can give black liquor of 10% solids concentration. All problems of silica, viscosity etc. are avoided since there is no evaporation or combustion. The capital cost of such a system is also claimed to be only half of conventional system. However, even though no smelt is produced, explosion hazards are to be anticipated and tackled as the system operates at about 20 MPa (approx 1400 psi). Therefore, small mills may be reluctant to adopt this technology.

Other alternative - Biological treatments

Until a commercially viable chemical recovery system is evolved for small paper mills, especially those based on straw as principal raw material, they can at least recover energy from the organics discharged in their effluents. There are several anaerobic systems operating successfully in the world and in India, Pudumjee Paper Mills have shown leadership by demonstrating at mill scale the benefits of anaerobic treatment of their effluent (9). Though capital costs are not mentioned, the energy recovery claimed is significant to sustain economic viability. This anaerobic treatment may be more advantageous for straw based mills, as straw spent liquors have more organic acids and less lignin than bagasse and hence can generate more bio-gas.

However, while this anaerobic treatment followed by conventional aerobic treatment can meet effluent standards, discharge of large quantities of lignin (which is not biodegradable) and sodium will continue unabated. As earlier, lignin contributes to colour of the effluent, wh becoming increasingly objectionable to the neighbou Colour removal by chemical methods can be indeed expensive (10,11). Fungal decolourisation, on which a is being presented in this seminar, could be a more cost tive alternative.

Prospects of emerging technologies

Organosolv pulping

Organosolv pulping developed in early 80's by R Technologies (APR Process or Alcell Process) and o holds a better prospect for agro-based raw materials bagasse and straw, than for forest based raw materials wood and bamboo, because of the lower lignin and ca hydrate content of the former. The conventional pro —soda/Kraft/AQ are not so selective in delignification, e cially in case of straw, since they give such a low yield though the lignin content is much lower. The Alcell Proc the simplest approach to Organosolv pulping, has also de loped a recovery process that recovers lignin and hemi lulose sugars, which can be used as an animal feed (12). Al lignin is a low molecular weight biodegradable material wh means it can generate bio-gas under anaerobic treatmen it can be used as a binder in wood panels. Solvent pulp carried out on rice straw has been reported to give hig screened yield at even higher kappa number for an al charge of only 6% (13). Though chemical recovery is ye be developed for this organosolv pulping, the spent liq from this pulping is expected to give much less pollution l in terms of sodium, lignin and colour.

Bio-pulping and bio-bleaching

The use of microbes in primary pulp manufactur broadly referred to as 'bio-pulping'. It is based on the abi of white-rot fungi to rapidly colonise wood and degra lignin. Extensive research work is being carried out all ov the world — at STFI in Sweden, Bio-pulping Consorti in Wisconsin, Tuscia University in Italy, Guangzhou Ins tute, China etc. Both basic and applied research efforts a underway in a number of laboratories around the world. So preliminary work carried out by us have shown promise terms of lower alkali charge for same Kappa Number a yield. Bio-bleaching by enzyme treatment has also sho improvement in brightness for chemical pulps as observed in the case of CTMP/CMP Pulps (14). Howev it requires very detailed basic research to understand mechanism of lignin degradation for various raw materi and identification of suitable pretreatment enzymes, be this bio-technology can be commercially exploited.

Membrane technologies

The application of membrane technology — Ultrafi tion (UF) and Reverse Osmosis (RO) — for processing

iquor from small paper mills has been studied and
d by Basu et al (15) over the last two decades. The
s aims at separation of high molecular weight fraction
ning mostly lignin, colouring compounds and some
soda) by ultrafiltration and concentration of sodium
unds remaining in UF permeate by passing through
embrane (tighter membrane). The overall objective is
ninate evaporation and combustion, and carry out caus-
g on the RO concentrate. But the UF concentrate (or
ate) still contains lignin and sodium, which poses same
em of disposal as before. The overall chemical recovery
o likely to be low, since nearly 25% of soda compounds
nt in black liquor is combined with high molecular
ht lignin fraction, which is lost in UF concentrate.

e most critical factor for membrane technology to be
effective in processing of black liquor is the degree of
ng, which determines flux and also the replacement cost
embranes. Even with excellent pretreatment by micro-
tion, fouling is expected to be so severe that it will reduce
within a few hours of operation. In case of silica rich
or, the fouling will be further aggravated by precipita-
of silica which occurs as active alkali concentration gets
eted in the UF concentrate. With the advent of high tem-
ture membranes (70°C plus), flux can be significantly
roved and with proper selection of membrane material,
ing also can be controlled. Since the manufacture of low
perature membranes (cellulose acetate) has just begun in
a, it would take quite some time for these special polymer
nbranes to be produced indigenously and become com-
cially attractive. Therefore membrane technology is not
an option to be considered for big paper mills, let alone
small paper mills.

gasification process

new black liquor gasification process developed in USA
ns to have great potential as an economically viable chem-
recovery system for small paper mills, including those
ed on rice straw. Demonstrated at pilot scale and person-
witnessed by the author, this innovative indirect fluid-
gasification has shown ability to handle black liquor at
solids concentration and yield a residue of 98%
CO_3 in the form of a dry powder. Since no smelt is pro-
ed and no pressure parts are involved, this process is ope-
onally risk free compared to smelters and wet cracking
cess. Further since pre-evaporation is required to be done
y upto 30% solids concentration and no combustion is
olved, problems of silica are avoided as silica gets purged
h lime sludge after causticising. The process claims that
product gas of calorific value 300 BTU/cu. ft. can be recy-
d to provide the necessary heat for gasification and does
require support of auxiliary fuel at feed concentration of
% black liquor solids. Since product gas is scrubbed to
orb 'S' gases and air used is comparatively lower, emission standards in respect of SO_x and NO_x are easily met.

The potential advantages of this process such as smelt free operation, ability to handle rice straw liquor and the modular design to suit pulp mills of 15 tpd capacity, render this system as the most appropriate and economically viable system for small paper mills.

Recommended treatment options

Small paper mills which produce chemical pulp less than 15 tpd or 5000 tpa cannot afford or justify installation of any chemical recovery system. As on date this would include 164 mills under category IV & V and, perhaps, may include about 30 odd mills in category III, thereby aggregating to about 200 mills. The pollution abatement strategy for these mills can be evolved around a combination of organosolv pulping, anaerobic treatment and fungal decolourisation.

Of all the emerging technologies, the gasification process seems to hold better commercial prospect as part of a chemical recovery system. It is claimed that this system can be applied to any capacity because of its modular construction but the rest of the system (evaporator + causticizing) seem to limit the viable size to about 15 tpd of pulp capacity (equivalent of 20-24 tpd of black liquor solids). This gasification process can solve the pollution problem of all mills coming under categories II and III (assuming that the 30 odd mills mentioned under 6.1 would be motivated to expand their chemical pulping capacity upto 15 tpd), thereby covering about 100 odd small paper mills. A few mills in category I can also adopt this technology more economically than conventional recovery system.

The sludge obtained in waste paper processing and other primary treatment of effluents can also be gasified as this gasification process accepts bio-mass of varying characteristics, including wet pith. This will be a great advantage to small mills, which are based on waste paper and also on simple wet depithing.

DARS process seems to be an attractive option for bagasse based mills of 30 tpd and above and hence can be adopted for a few mills in category I.

The existing big mills, desirous of introducing a new pulping line based on straw or bagasse, (to augment their wood/bamboo supply) have to expand the capacities of evaporators because of the low concentration of spent liquor from these agro-based raw materials. Since the gasification process accepts feed at concentration around 30%, evaporator capacity need not be increased and hence capital cost additions can be contained.

Membrane technology can be more gainfully employed for recovering chemicals from spent liquor from CTMP/CMP stages. A screw press can be used to squeeze out residual liquor to obtain a reasonable level of solids concentration (4-8%). This is subsequently prefiltered in a cartridge filter and processed in a Ultrafiltration to recover ligno-sulphonates which can be sold or incinerated. Detailed work carried out in a pilot plant in Canada has shown BOD reduction of 60% (16). Colour is also expected to be removed. The high flux rates obtained even at elevated temperatures is indeed encouraging, in the context of small paper mills (categories IV and V) who also can now resort to, perhaps, sulphite pulping, which gives higher yield. Further developmental work needs to be done in this area.

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ey success factors in an advanced control project*

MYKE J. KING
KBC Advanced Technologies Ltd.

ast decade advanced control projects have been in major refinery and chemical plants all over ving substantial benefits to the end users. These only be realised if the project is carefully executed. This paper aims to show what is meant 'advanced control'' and what factors are impor- uccessful execution of an advanced control pro-

of plant computerisation

demonstrates that the term ''advanced control'' lied to increasing levels of technology which ple control objectives more effectively. Similarly ed to describe strategies which enable more com- ng objectives to be achieved. Either way advanced lves improving the operation of a plant by moving control hierarchy. In order to achieve an improve- e next level, it is necessary to obtain success at one. For instance, regulatory control of a distil- mn is only possible if the plant instrumentation quate and operational. Having achieved satisfactory control it is then possible to progress to advanced and constraint control. The most benefits are y implementing plant optimisation with the use of on packages and plant management information

Incentives for advanced control

Before embarking on an advanced control project it is necessary to be aware of the optimum operating strategies on the plant and the physical constraints and product quality limits that define the optimum operation. Planning tools like DISTOP, VISTOP, CATOP and PETROFINE can identify these operations and provide the sensitivity of operating profitability to the closeness of approach to the operating constraints or targets.

From experience of the application of different degrees of advanced control it is possible to quantify the movement towards optimum constraint and operating targets that can be achieved. This information, together with the above sensitivity of operating profitability, leads to estimates of the incentives for various types of projects.

Incentives for regulatory control

When it is desired to operate at a constrained optimum, for example, product quality, any movement away from this optimum costs money. Poor control due to lack of sufficient instrumentation or understanding of the plant operation would not enable operation anywhere near the optimum. The introduction of regulatory control and improved response to plant disturbances would allow the optimum to be more closely approached. Advanced regulatory control, for example feed forward control with dynamic decoupling, allows operation

Definition of 'advanced control'

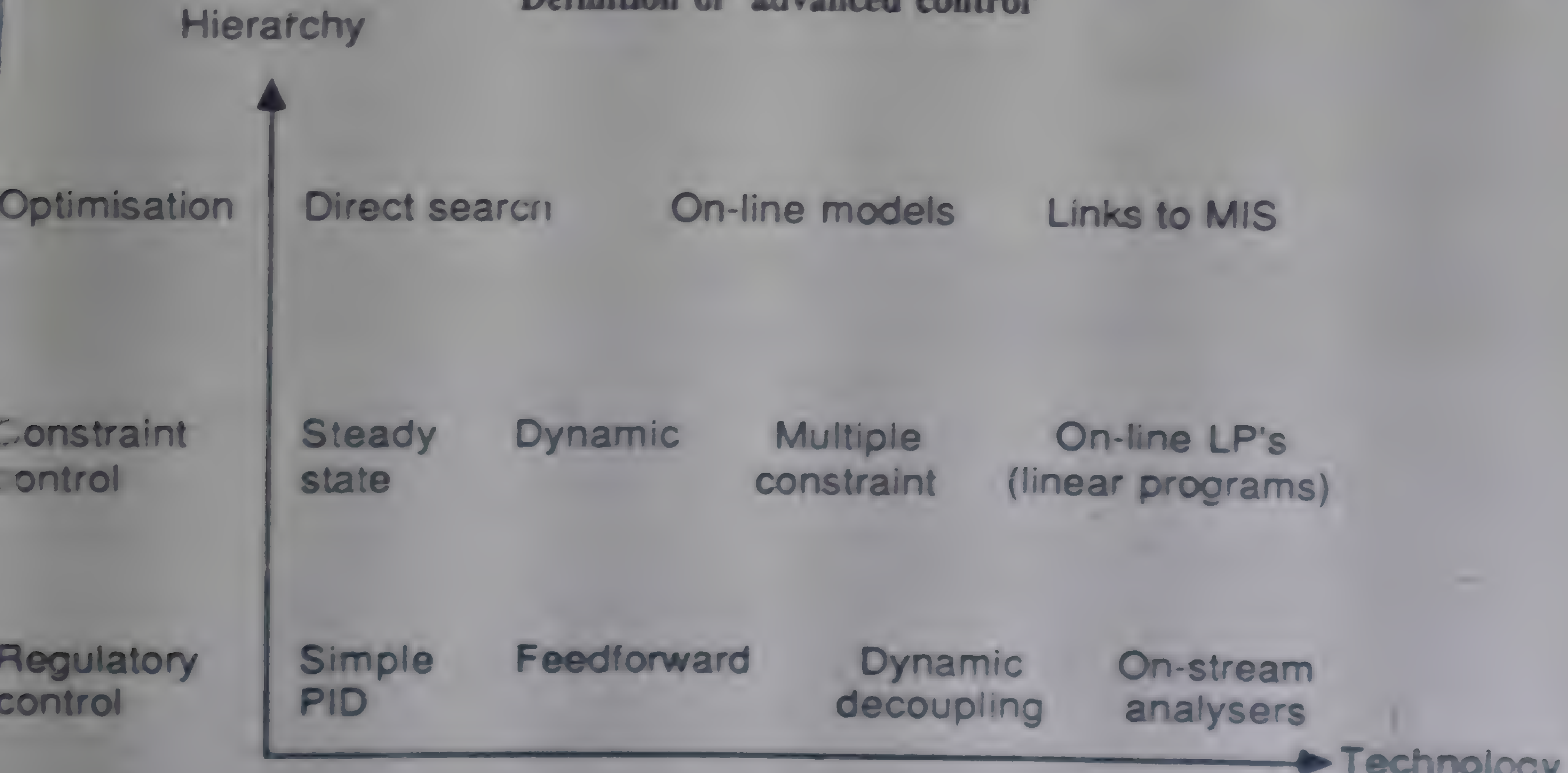

Figure 1

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resented at the Oil, Gas and Petrochemical Seminar in 1989.

nuch closer to the optimum giving increased benefits and a more stable and safe operation.

In plant operations where there is an unconstrained, desired operating value, the incentive is to prevent large swings around this value. Operation at an unnecessarily high severity, for example, when it is not desired, costs a disproportionately large amount of money. This in turn makes average operating costs higher than they would be if the operation was closer to the desired value.

In addition there are less tangible but nevertheless potentially large benefits which arise from the installation of modern control systems. These include:

- reduction in maintenance costs;
- more effective use of process operators;
- faster diagnosis of operating problems;
- reduced possibility of operating error;
- increased staff motivation;
- faster implementation of changes in operating philosophy;
- improved public image and customer credibility;
- easier recruiting;
- reduction in control system failures.

Incentives for constraint control

As mentioned earlier, there are substantial benefits in operating as close to a constraint as possible. This is particularly true when the constraint is moving. It is then desirable to use constraint control. Typical applications would include maximising FCCU conversion or feedrate. The incentives for constraint control are shown in Figure 2. Operation away from the constraint loses benefits, but so does poor response to changes in the constraint.

Incentives for constraint control

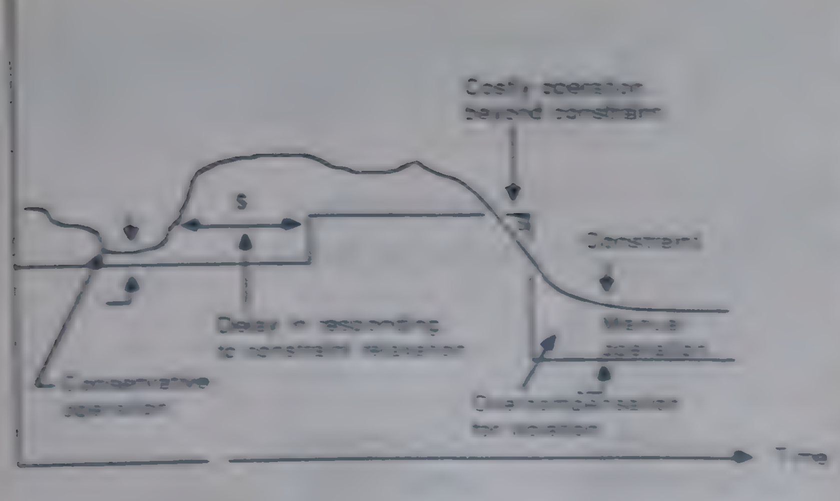


Figure 2

Incentives for optimisation

Every unit operation on a refinery has an optimu function for a given set of plant conditions. The m benefits from a control application may be achieve optimum is identified and the plant control is moved it. As the plant conditions change, however, so does mum. An on-line optimisation package will track th tion and ensure that the plant is always operating at m profit.

Incentive for manufacturing information system

Traditionally plant information on a refinery has be lected by engineers monitoring key operating variab recording them on paper. While effective in obtainin of the data, this method is not always successful for reasons. Firstly, while every endeavour is taken to col information on time, it always happens that if a pr occurs a particular piece of information is missing. Se having collected the data and evaluated it, there is lit left to actually solve any problems which are highl

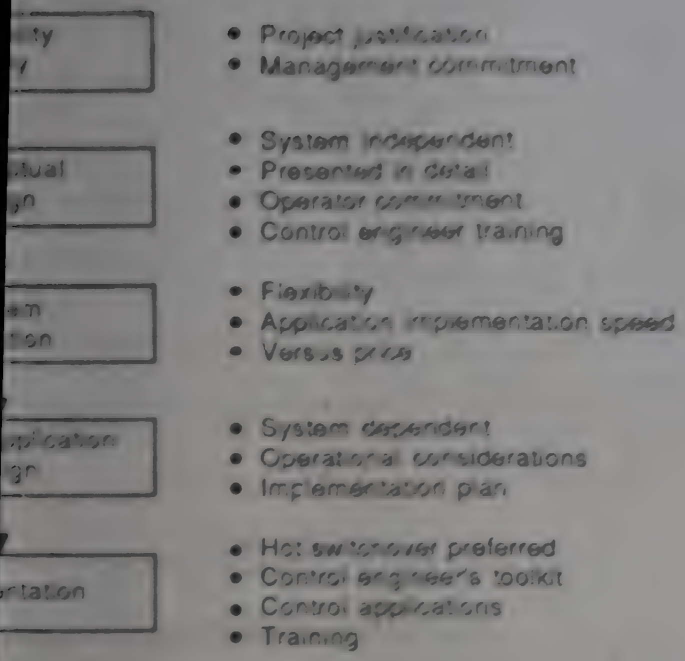
A manufacturing information system including a grated process, laboratory and inventory database ca lect data and manipulate it on a continuous basis, leaving time for actual problem solving. This ultimately le increased yields and saves energy, losses and marg Planned performance is also enhanced by better p maintenance and turnaround periods.

Advanced control project planning

It is essential when planning an advanced control p to integrate activities. If the ultimate goal is a site-wid cess control and information system then all activities s be planned with this in mind. It is unlikely to be pra to install fully integrated computerisation as one proje number of sub-projects will lead to the same result pro each is consistent with the ultimate goal.

The "flow" of an advanced control project should through several well defined stages from design to hand as shown in Figure 3. Initially a feasibility study mu undertaken to determine whether the project is viable. is then presented to the management in order to gain mitment and indicate the potential benefits of a control ject. Having gained approval for the project the next consists of the conceptual design of the applications. involves plant testing and monitoring in order to cal parameters for the controls system design. The applic design at this stage is system independent but presents application in detail both as a description and flow diag The "black box" approach of having many signals ent a box on a flow diagram and one signal leaving as a set p to a controller, is fine for indicating operating objective can lead to confusion at the design stage.

dvanced control project plan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Project justification
Management commitment
System independent
Presented in detail
Operator commitment
Control engineer training
Flexibility
Application implementation speed
Versus price
System dependent
Operational considerations
Implementation plan
Hot switchover preferred
Control engineer's toolkit
Control applications
Training

Figure 3

l application designs may then be reviewed at
neetings with the "users" (operations) in order
tance. This also provides the initial part of the
o engineers training. A system is then selected
able to achieve the desired results. Many fac-
o consideration here, for instance, ease of con-
exibility, computing power, operator interface,
Having chosen a system, the applications are
detail for compatibility, although the concepts
ame. Finally, the applications are installed on
e success of the whole project rests on a well
executed implementation phase. Applications
plemented in order which maximises benefits
s operations and management commitment. The
h aids such as CUPID can also increase accep-
easing the initial success rate of installed appli-

planning and organisation

advanced control project involves the integra-
a types of manpower such as the client's own
e engineering contractor, the vendor's installa-
s and the advanced control specialists. The max-
from application engineers occurs at the
d the end of the project, that is, the design and
ion stages. It is significant that the success of the
nds on these stages being well executed.

important aspect of an advanced control project
well balanced organisation which stays together
h of the project, and in the case of client's engineers, behind. The team should consist of a project manager and representatives from the client, the contractor, the vendor and experienced advanced control specialists. The client's staff should come from process, systems, instruments and control, with the advanced control specialists providing additional control resource and training the client's engineers for long term support. Long term support of the applications can produce large impacts on the benefits. For instance, without the necessary manpower of the right skills, applications service factors can be as low as 35%. For as little as 5% of the project cost, the additional skilled manpower to support the control applications could have an impact as great as 60% on the benefits by increasing service factors to over 90%.

Monitoring performance

A typical graphical representation of performance monitoring for an advanced control project is shown in Figure 4. The theoretical maximum benefits obtainable are those which could be achieved if the best technology were used and plant conditions were always ideal. A practical maximum figure is arrived at by only considering applications which are able to be implemented within the scope of the project due to constraints on return on investment. By the same token certain applications are not considered viable since the implementation effort required would not yield sufficient benefits a target for applications which can realistically be implemented and return sufficient benefits may then be arrived at, which is usually around 95% of the theoretical maximum. Since applications rarely have a 100% service factor due to process and instrumentation problems, an achievable target of 90-95% of this figure is set. As the project proceeds the benefits attained may be monitored against the targets. The result is that achieved benefits are usually higher than predicted.

Monitoring performance

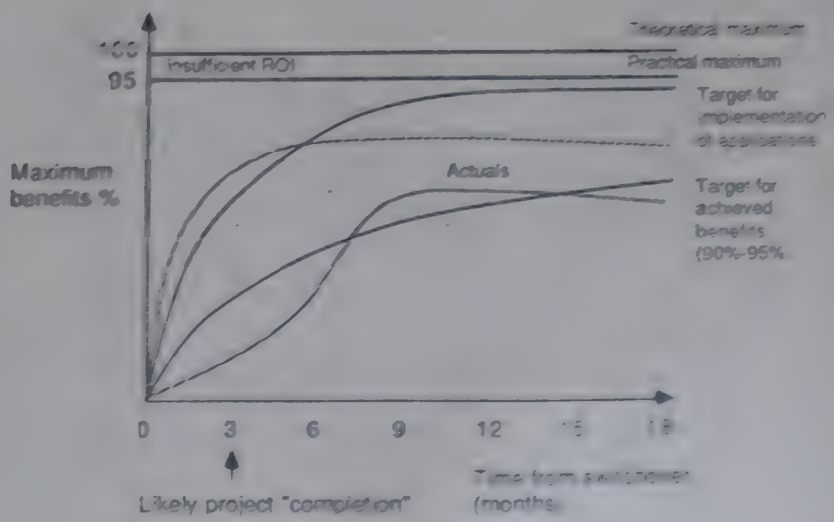

Figure 4

Summary

To capture all the potential benefits an integrated approach is required. With the help of planning tools such as PETROFINE, benefits identified by studies will be maintained despite changing economic objectives. Linked with information systems, monitoring tools such as DISTOP and CATOP produce rapid diagnosis of operating problems. Advanced controls ensure that the process is consistently held close to its optimal operation. The interrelation between these factors is illustrated in Figure 5.

Use of a systematic approach to advanced control projects ensures lower costs and earlier capture of these benefits. Figure 6 shows the effect on payback. Figure 7 shows the further improvement to payback possible by adopting proper implementation methodology.

Benefits of integration

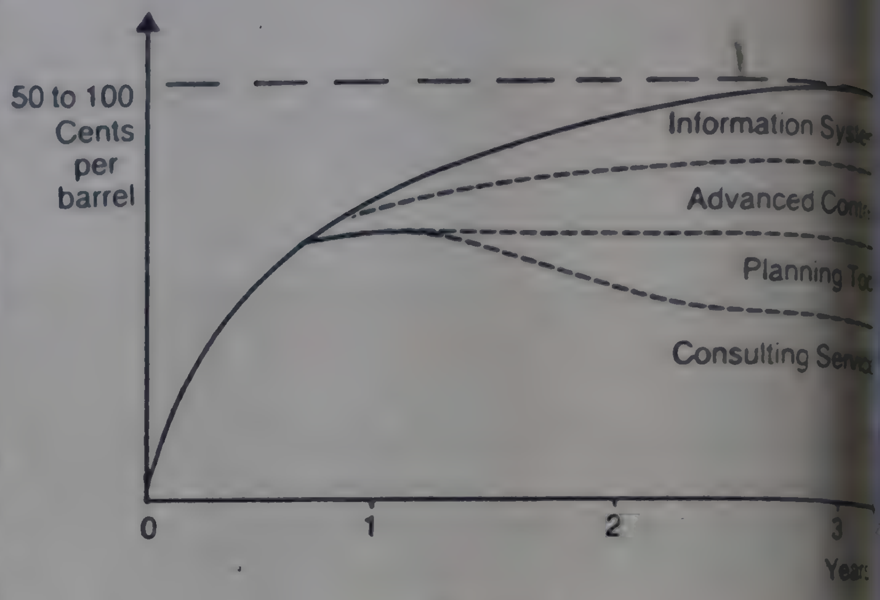

Figure 5

Getting the design right

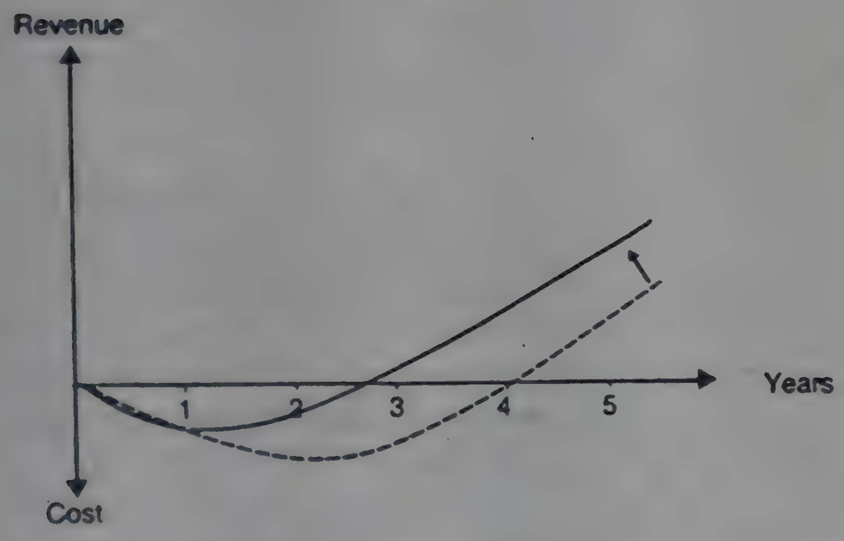

Figure 6

Getting implementation right

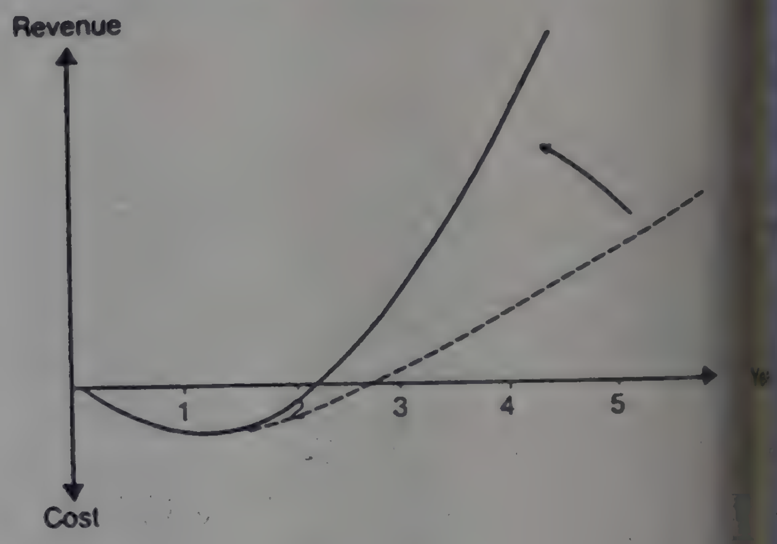

Figure 7

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Oil spill management: Possible role of biotechnology

MANJEET SINGH
Applied Biology Group, Research Centre, Indian Petrochemicals Corporation Ltd.,
P.O. Petrochemicals, Baroda 391 346.

ges caused by oil pollution are both significant and
Cleaning up an oil polluted area is time consuming,
and costly. During the last few years, number of bio-
gical developments have taken place, which may
a better solution with relation to physico-chemical
s in the near future.

ction

pill has become an unavoidable part of oil industry,
of increasing production and transportation activi-
e situation is alarming world wide and needs atten-
eaning up an oil contaminated area is time-consuming,
t and costly. To the cost of cleanup must be added
of oil invasion itself, the destruction of fish and other
e, damage to property, contamination to public water
s and any number of other material and aesthetic
Depending on the type and quantity of oil involved,
osses may extend from months to years, sometimes
ades, with correspondingly heavy cost on restoring
a to prior condition.

of oil spill on the environment

nages caused by oil pollution are both significant and
. Such pollution can destroy or limit marine life, ruin
e habitat, kill birds, limit or destroy the recreational
of beach areas, contaminate water supply and create
zards. It is difficult to evaluate the effects of oil since
t a single substance but a complicated mixture of liter-
ousands of chemical compounds. Some of the toxic
s especially with reference to oil pollution in marine
nment can be noted from following points. (1,2):
rect kill of organisms through coating or contact poi-
ning
evention of gases exchange across the air-water inter-
e, causing oxygen shortage for aerobic organisms
evention of light transmission, thus stopping photosyn-
sis — a vital process for cellular synthesis in green
ants
corporation of sublethal doses of oil into organisms
sulting in reduced resistance to infection and other stress
struction of food values through incorporation of oil
d oil products, into fisheries resources
terruption of numerous events necessary for the pro-
gation of marine species and for the survival of those
ecies which stand higher in the marine food web.
corporation of carcinogens into marine food chain and
man food sources.

The fate of spilled oil

Spilled oil in sea water is altered first by physical movement. Oil can move to a greater distance in water and as it moves it changes chemically. The processes involved in changing oil chemically are collectively called weathering or natural degradation (2). They include:

1. Spreading
2. Evaporation
3. Dissolution
4. Emulsification
5. Auto-oxidation
6. Microbial degradation
    0- aerobic microbial oxidation
    0- anaerobic microbial oxidation
7. Sinking
8. Resurfacing

How fast oil degrades is markedly influenced by light, temperature, nutrients and inorganic substances, winds, tides, currents, and waves. Degradation rate appears to vary with the composition of oil. The more toxic fractions are generally less susceptible to microbial attack. The heavy residue that do not degrade may be deposited in sediments or they may float as tar lumps or tar balls.

Physical-chemical treatment of oil spill

A number of factors influence the choice of oil spill removal techniques, including type & amount of petroleum products spilled, water current, weather, equipment available, and such special considerations on the presence of marine life, closeness to drinking water intakes, fishing ground, wildlife habitat or bathing beach. Once a spill has been contained, clena up measures can be instituted. Following physical-chemical methods are being undertaken to remove oil spill:

1. Dispersion

Dispersants serve to increase the surface area of an oil slick and disperse oil globules throughout the larger volume of water. Then in time, nature takes care of it by bacterial action. Chemical dispersants are usually applied by spraying, and agitation usually is necessary to insure proper mixing. Wind and wave action is some time sufficient. After widespread dispersant use during the major incidents, reports led to the conclusion that dispersants or the dispersant-oil mixture caused more damage to aquatic life than the oil alone. For beaches, they actually compounded the problem by adding to the amount of pollutants present, by causing the oil to penetrate more deeply into the sand, and by disturbing the sand's compactness, so as to increase beach erosion through tidal and wave action.

2. Sorption

Oil is soaked by an absorbant; it clings to the surface of particles on a absorbent. Materials used for this purpose include straw, foamed plastics, cotton waste, talc, and dried volcanic rock; and are selected based on their properties for picking up oil. In general, the lower the density of sorbent, the more oil it can pick up per unit weight. Based on the origin, sorbents may be divided into three general classes: 1. natural products, 2. modified or chemically treated natural products, 3. synthetic or man made products.

3. Sinking

It is also possible to dispose of floating oil by sinking it. In sinking operations, special powdered materials are spread over the oil. The oil adheres to the surface of these materials; the combination being heavier than water, sinks to the bottom. Various kinds of natural materials and synthetic products are available which are claimed to be effective in sinking oil slicks. Typical agents include treated sand, brick dust, cement, silicone coated materials, fly ash, and special types of clay. Sinking agents are believed to be most efficiently employed on thick, heavy and weathered oil slicks in contrast to relatively light and fresh oil. These agents must be evenly distributed over the surface of slick and supplied with proper mixing, agitation and time interaction. The particles coated and agglomerated mass eventually becomes heavier than water and sinks to the bottom.

4. Gelling/Coagulation

Gelling agents may be applied over the surface of periphery of floating oil slick and intended to absorb, entrap, fix or make the oil mass more rigid or viscous so as to facilitate subsequent physical or mechanical pick up. Possible gel agents include molten wax or soap solution, lanolin, liquid solutions of natural fatty acids, soap of alkaline metals, treated colloidal silicas, the amine-isocyanates, and the polymer systems

5. Magnetic separation

This process involves dispersing a hydrocarbon base ferrofluid containing an oil soluble, water-insoluble surfactant and a stable colloid of magnetic solids, e.g., magnetite into the oil slick, then using the magnetic field to attract and pickup the oil spill, which is now magnetically responsive.

6. Combustion

Another way of disposing of oil on water is to burn it. The success of this method depends on supplying the blaze with sufficient oxygen and keeping it hot enough. One problem is that the thin layer of oil is cooled by the water, making it nearly impossible to ignite. So for burning the oil slick a thickness of more than 2mm is required. However, there disadvantages in burning. It results in air pollution, and it create fire hazard. For these reasons, burning is not usu practical in sheltered water, although it may be desirabl burn oil on the open sea.

Biotechnological developments for possible treatme

A. Use of hydrocarbon degrading microorganisms

Natural degradation process depends on the activities microorganisms. It is an established fact that practically mo petroleum hydrocarbons are sensitive to microbial enzym The natural process of biodegradation of oil by the norm microflora is very slow; hence it takes a long time to remo oil. Addition of external microbial cultures will, therefo greatly enhance the process rate.

The ability to degrade or chemicaly modify hydrocarbo molecules is wide spread among the microorganisms and fo lowing general observations are made (3). a) Aliphatic hydr carbons are degraded and assimilated by a wide range microorganisms. Other classes including aromatics may b partly oxidised but are assimilated only by a few bacteri b) n-alkane of chain length shorter than n-nonane are not usually assimilated but may be oxidised. Relatively few bacteri have the ability to grow on alkanes shorter than n-octane The short chain liquid hydrocarbons are thought to be poo substrate because of their toxic effects on microbes. As the chain length of n-alkane increases beyond C_8, the yiel factor increases. c) Saturated compounds are degraded much faster than unsaturated ones. d) Straight chain compounds are degraded more easily than branched ones.

Before biodegradation can occur, hydrocarbons have t enter the cytoplasm of microorganisms and there is some controversy over the mechanisms used to take up these substrates with low water solubility, especially the liquid ones (4). The initial interaction takes place either by contact of microorganism with insoluble substrate directly, i.e. without involving a mediator (unmediated interaction), or by the contact through a mediator (mediated interaction). Mediator plays a role by emulsifying the hydrocarbon.

A model method for using mixed microbial culture has been discussed by Chauhan and Goyal (5). Here a low toxicity dispersions with improved microbial cultures together with phosphorous and nitrogen minerals should be sprayed on the water surface containing spilled oil. The oil globules with dispersants microorganisms and added nutrients will spread over the water surface. The microbial cells will sta multiplying and in the process will destroy the oil and dispersant. The microbial biomass formed as a result of growth will die for want of food when the oil quantity is exhausted The dead biomass then enters the marine food chain.

been established that key steps in the degradation
ıydrocarbons are plasmid mediated. In a recent study,
asili et. al. (6) has concluded that plasmid acquisi-
acteria may be part of their adaptation to conditions
carbon contamination. Emulsification and subsequent
ion of hydrocarbon by these bacteria suggest that they
ve useful in the weathering of oil spills.

hallenge of finding a bacterium to degrade all kinds
ills is formidable. Mixed bacterial cultures can offer
rospects, but instability of mixed culture and com-
among the individual strains would be a drawback.
the most promising long term approach rests in gen-
constructing a suitable bacterium. Prof. A.M. Chak-
has already shown in 1976, the possibility of this
h by combining the plasmids from four different bac-
rains, capable of digesting different types of hydro-
into one organism. This organism has a much faster
rate on crude oil than any of the individual strains
ws promise as a means for dealing oil spills. (7).

of biosurfactants/bioemulsifiers as dispersants

ırfactants are new kind of products, their complete
l has not yet been realised. However, it offers number
ıtages over the chemical dispersants (8). 1. They form
ble emulsions because of their high molecular weight,
have shown higher surface activity in number of
. They are stable even at temperatures upto 90°C and
olutions upto 10% concentration, 4. They are non-
They can be inactivated under mild conditions using
enzymes, and 6. They are easily biodegradable.

ırfactants/ bioemulsifiers are secreted in the culture
during the microbial growth on hydrocarbons. Chem-
ıey are high molecular weight compounds, consisting of lipids along with protein and/or carbohydrates (8,9). The most common hydrophobic group is the hydrocarbon chain of fatty acids. The polar or hydrophilic group includes a wide range of organic functional groups, such as, the phosphate containing portions of phospholipids, ester and alcohol function group of neutral lipids, the sugars of glycolipids, or acetate group. In the literature, these compounds are named as: sophorolipid, rhamnolipid, trehlose lipid, surfacctin, emulsan etc.

Oil-slick dispersion studies has been conducted by the group of Dr. Anand Chakrabarty in the USA by using an bioemulsifier (EM) isolated from Pseudomonas aeruginosa SB30 (10). The oil slick dispersing efficiency of EM was assigned a rating of 1.8, though the maximum possible efficiency is of 2 (U.2. Patent 600972). However, a number of experiments are needed to be carried out to explore the applicability of biosurfactants/bioemulsifiers for the control of oil spill.

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2,6 Dichloro Aniline
Dicyandiamide
DV Acid
Ethylene Glycol (Mono/Di)
Ethyl Iodide
Formic Acid
Glycerine
Indolinone
J Acid
Lactic Acid
Maleic Anhydride
Methylene Chloride
Oleopine Resin
Phenol
Phosphoric Acid
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Amino Nitrogen	%	3.5	4.2	5
Total Protein	%	43.0	55.0	73
Water Solution	5%	Clear	Clear	Clea
Copper	mg/100 gm.	–	11.0	14
Iron	mg/100 gm.	–	18.0	23
Vitamins				
B1	mcg/g	40.0	53.0	90
B2	mcg/g	25.0	38.0	50
B6	mcg/g	15.0	16.5	21
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Niacine	mcg/g	150.0	236.8	313

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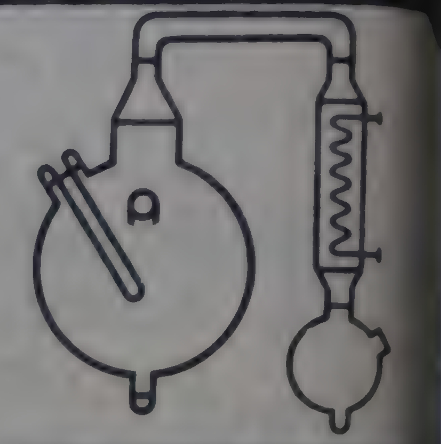

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Chemical News From Abroad

AS TURNOVER UP IN
LF

egussa Group's turnover rose
cond half of the business year
7,478 million Deutschmarks
nd throughout the entire busi-
also by 6% to 14,357 million
the principal growth in turn-
s achieved abroad, the propor-
foreign origin increased by 1
ge point to 74%. Excluding
metals value, turnover rose by
the 1988/89 business year.

lts for the Degussa Group again
d the previous year's figures for
nd half of the business year,
the growth rate was slightly
n the particularly high level
d for the corresponding period
revious business year. For the
business year as a whole, the
Group's pre-tax results of 338
DM were the best ever, up by
the previous year. Degussa AG
rded higher pre-tax profits of
lion DM (+ 11%) than in the
s year.

Group's Corporate Sectors
d the following progress: The
Sector registered an increase in
of 2%, despite falling DM gold
er quotations both in the second
he year and throughout the year
ole. Results excluding precious
increased more significantly by
d 7% for these respective per-
oup results for the Metals Sector
d considerably in the second
the business year, producing an
improvement on the previous

Chemicals Sector, turnover for
nd half of the business year rose
to 2,383 million DM, represent-
umulative increase for the year
The Chemicals Sector has once
achieved outstanding results,
must nevertheless be offset
against higher costs for raw materials in the second half of the business year.

The Pharmaceuticals Sector (including Dental Division) recorded a cumulative increase in turnover of 12%. Results for both the Dental Division and the ASTA Pharma Group rose considerably in the business year. Growth in the Dental Division can be attributed to the particularly good first quarter of the business year, in which a high level of dental treatment was carried out before the German health reform.

Group investments in fixed assets totalled 531 million DM for the 1988/89 business year as a whole, compared with 449 million DM in the previous year. Investments in financial assets totalled 108 million DM (previous year: 85 million DM).

On September 30, 1989 the Degussa Group employed a workforce of 33,698, including 11,387 abroad. Personnel costs rose by 10% to 2,486 million DM for the business year.

Our production plants were very busy at the start of the new 1989/90 business year. As a result of the continuing high level of orders on our books, we expect our production facilities to remain operating at high capacity. Nevertheless, due to rising costs it will be no easy task to achieve further improvements in our results, given the high level already reached."

MONTEDISON DISCONTENT UNSETTLES ENIMONT

Montedison's directors have agreed that its contractual relationship with Enichem is to undergo substantial changes. This follows news that a controversial tax decree favouring Montedison's provisions to Enimont has been postponed by the Italian parliament until December.

The delay is the latest in a series of disagreements over the proposed tax law, now being investigated by the EC commission for possible violation of fair competition principles. If the law is not passed before 31 December 1989, when Montedison closes its balance sheets for 1989, the company will owe about L1.2-trillion ($908m) for the year.

This will derive from taxes on capital gains reaped from the transfer of its chemicals, fertilizers, fibres and elastomers assets to Enimont earlier this year. However, if the tax proposal passes in time, Montedison could defer payment of some L825bn of the taxes owed.

Montedison's chairman Raul Gardini says if the current situation continues it will go against the very premises on which the joint venture was founded. The claim had previously been rejected following Sir Leon Brittan's objections because it did not comply with EC ruling and legislation.

Meanwhile, the situation has aroused much speculation over Gardini's plans for Montedison. Certain sources say his statement is designed to influence the government towards granting the tax allowance.

Both the media and market observers are currently speculating over the possible sale of Montedison's 40 per cent stake in Enimont. Among those rumoured to be interested are Dow, which currently owns a majority stake in Montedison, BASF and ICI. However, said a source, "with the possibility of a non-Italian company moving into the market, the government will do all in its power to ensure that Gardini's demands are met."

However, other market observers are going as far as to say that Gardini is actually planning a complete takeover of Enichem's share in the Italian chemical partnership.

The chairman has already announced his intentions to do this when the venture's three year consolidation period is completed. However, one London analyst said this was highly unlikely considering Montedison's current financial situation. Meanwhile, some believe Enimont will be split into two separate companies, a move which will take the situation back to square one.

The ENI executive body has issued a statement saying that the Enimont venture would remain intact and neither company would withdraw its interest. Industry observers say ENI is quoted to have said, "Enimont is a prosperous partnership and we foresee no problems."

Meanwhile, the Italian government is still reviewing the tax situation and it is believed that a decision will be made recently when officials vote on the issue.

The latest developments have continued to create even more speculation, say sources.

The latest rumours in the Italian press say Gardini could still withdraw part of his interest in Enimont and a likely successor could be the Italian chemicals, defence and space group, Snia.

EC NEARS MERGER AGREEMENT

After over 15 years of discussion, EC ministers have finally agreed the outline of proposed community regulations on cross-border merger controls. Although some finer details are still to be resolved, the final draft is scheduled to go before council for approval on 21st December.

"We are reasonably hopeful of its adoption," a spokesman at DGIV, the competition directorate, said. The regulations would come into effect nine months after acceptance, and so should be in place by the end of 1990, he said.

Under the proposed regulations, all mergers with a combined turnover of over Ecu5bn ($5.69bn) and with not more than two thirds in one member state would be vetted by the commission.

In order to suit smaller countries without their own antitrust bodies, national authorities could also hand over to the commission oversight powers for mergers with a combined turnover of Ecu2-5bn. However, all national authorities would retain control over mergers in the defence and media sectors.

The commission would have to indicate its decision on a proposed merger within one month and give its final decision within four months, said the spokesman.

Ministers are still in disagreement over whether national antitrust bodies could still disallow a merger approved by the commission. West Germany, in particular, wants its Bundeskartellamt to retain veto powers for larger mergers. A compromise has been suggested however, under which the commission could delegate its veto powers back to the national authority if the antitrust problem was specific to that country.

BASF DISCUSSES BRAZIL PROJECTS

BASF's Chairman in Brazil, Heinz Wollenweber, has disclosed plans to invest locally an average of $80m/year over the next three years. He said priority will be given to small scale projects and industrial facility expansions.

He stressed the group will not be influenced by the results of the next presidential election in Brazil. BASF's projects were designed according to market opportunities and do not change with political will, he added.

One of the new projects to go ahead is a choline chloride plant, to meet [illegible] production at

Camaçari. The cost
around $5m, confirm

The remaining $80
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Wollenweber, but he
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PROBLEMS LOOM
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CFP, would mean cutt
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divisions -- petrochem
specialities. In fact it is
the main stumbling
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presidency in February
to give up.

Observers also quer
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in the summer, which
ized by the year end. Alt
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proceeding "satisfactor
are unsure what effect
have on the planned de

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tions. In addition,
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overall sales dimension needed to bring it on a par with the world's large chemicals groups.

Besides all the financial and judicial problems, the authorities now seem to be losing sight of the human aspect, which they had said was an important factor to be considered in any restructuring. In effect, there is great despondency within EMC and especially Orkem, which had developed a strong company spirit under the successful leadership of Tchuruk.

Meanwhile, Orkem has announced a new joint venture in Brazil teaming up with Eucatex (50 per cent) and Bamerindus (5 per cent) in an activated earths project. The new project, to be called Argilex, will be based in Maua, Sao Paulo state. It will involve an investment of around $6m to establish a 12,000 ton/year rare earths facility for rare earths which have applications in the production of vegetable oils. Argilex is aiming at a turnover of $6/year when operating at full capacity.

MEDIRACE AIMS FOR EUROPEAN BASE

The acquisition of Evans Healthcare by Medirace, the medical research and diagnostic products company, reflects Medirace's aim to develop the combined businesses into one of Europe's major players in the pharmaceutical market. Originally established in 1987 to research and develop Aids and cancer treatments, the UK concern has since expanded into diagnostic products with the acquisition of Cambridge Life Sciences and Walker Laboratories.

Although all of its acquisitions so far have been in the UK, the company is also looking at possible acquisitions in continental Europe, David Lees, director of Medirace, told the press. Evan's human vaccines activities are regarded as a particularly exciting area by Medirace, said Lees. It is currently sponsoring clinical trials in the UK and US to study the effectiveness of a form of BCG vaccine in treating superficial bladder cancer, and has also commenced work on producing certain antigens of the Aids virus. These areas are expected to complement Medirace's R&D, especially in the development of its Contracan cancer treatment.

The £87m ($136m) deal will more than treble the size of Medirace. It is to be financed principally by a rights issue. After the acquisition is completed, the company will seek an official listing on the UK stock exchange around the end of January 1990, said Lees.

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Chemical markets abroad

FAR EAST ETHYLENE FUTURE REMAINS UNCERTAIN

Ethylene production is expanding vigorously in the Far East, but coordination among producers will be necessary if the market is to absorb the new capacity.

The availability of cheap Saudi imports for the Japanese market has, in the past, constrained the building of new capacity. Now, however, Japan's Ministry of Trade and Industry (MITI) is approving expansion by stages to meet the current buoyant demand. On the basis of MITI figures for quarter four, demand is up 7.9 per cent inclusive of exports while domestic demand has risen 4.7 per cent. Consumption this year is at 5.9m ton, and a growth rate of 4-5 per cent is expected over the next few years.

For Korea, assuming ethylene demand growth to be commensurate with GNP growth, a rise of 7 per cent/year appears possible through to 1992.

In August, Japan's ethylene capacity stood (1989 being a year of periodical repair) at 5.49m. ton/year, 430,000 ton/year more than the corresponding 1988 levels. By company, Showa Denko had passed from 488,000 ton/year in August 1988 to 602,000 ton/year (for years of no repair). It plans to attain 704,000 ton/year in October 1990. Mitsui Petrochemical Industries has attained an added 92,000 ton/year capacity. Ukishima Petrochemical has increased levels from 651,000 ton/year to 968,000 ton/year.

MITI is now virtually certain to give the go-ahead to Mitsubishi's Kashima project for an estimated 370,000 ton/year capacity. The facility may be operational in spring 1992.

Second in order of priority is the Maruzen-Idemitsu-Sumitomo joint project in Chiba, for [illegible] year, expected on-stream in the spring of 1993.

However, even these "priority" ventures may be reappraised in the light of the future market situation. The outlook is far more doubtful for a second line of expansions planned by Showa Denko in Oita, Mitsui and Toatsu Chemical in Ube, Asahi in Mizushima and Toyo Soda in Yokkaichi.

In Korea, there is concern that uncoordinated expansions will accelerate capacity build-up beyond market equilibrium.

With the coming on-stream of Yukong and Daelim's second plants at Ulsan (400,000 ton/year) and Yochon (250,000 ton/year) respectively, Korean capacity is set to reach 1.15m. ton/year. At present this is still insufficient to meet demand.

However, further impressive capacity expansions are expected over the coming years. Expansions will follow by Samsung (400,000 ton/year), Hyundai (350,000 ton/year) and Korea Petrochemical Industry (250,000 ton/year). These start-ups are expected on-stream by the end of 1991 at the earliest.

Korean capacity will thus reach 2.15m ton/year by 1992; by the end of 1993, levels may be almost five times their present value, at 2.43m. ton/year. "We are concerned about future levels of demand, we will need an adjustment in capacity," said a spokesman for one of the major participants in the next wave of Korean ethylene expansions. When asked whether his own group might revise its plans in the light of uncertainty over capacity absorption, another executive for the same group replied that it would be up to the later wave of entrants to consider restraint.

In 1990 Korea is still expected to import [illegible] ton of ethylene from [illegible]

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has helped to provide a motor for prices. Due to speculation on increased ABS production after the Lucky Chemicals production outage, Korea increased its purchases of material.

Japan has also been more active in the market than had previously been expected. A series of maintenance turnarounds are just being completed and this is limiting domestic supplies. Asahi has debottlenecked its Mizushima plant by 30,000 ton/year raising nameplate capacity to 400,000 ton/year.

Sumitomo has increased its output by a similar amount, giving it a nameplate capacity of 330,000 ton/year. Mitsubishi Petrochemicals recently completed maintenance work at its 170,000 ton/year Yokkaichi plant, while Idemitsu Petrochemical is in the throes of completing maintenance work at its 90,000 ton/year Tokuyama plant.

The shortage in domestic production due to outages has been made worse by strong derivative demand. According to PCI consultant Vince Sinclair, Japanese PS demand is running at 7 per cent higher this year, while low inventories are forcing the purchase of export product.

Traders had been playing an active role in the Far East market up until early November, but this has now diminished. Up to 12,000 ton of material appears to have passed through traders hands. The majority of export material is believed to have come from European producers looking for lower inventories. Prices of $580/ton fob Europe for export have been bandied about the market.

Traders have declared that Far East numbers range from $640-655/ton c&f Far East, with some sellers claiming as high as $685/ton c&f Far East. There is speculation that the Far East is still short, with buyers poised to enter the spot market.

The [illegible] market reflects the

current perceived tightness in supplies. November styrene contracts were generally fixed at 32 cents/pound. December figures have been posted at 35-38 cents/pound, although some discounts are expected.

US PHOSPHATE OUTPUT HIKE

US production of marketable phosphate rock rose to 49.[illegible]m ton during crop year 1989, 1st July 1988 to 30th June 1989, an increase of 15 per cent over 1988 production, says the Bureau of Mines, US Department of the Interior.

The amount of marketable rock sold or used increased by approximately [illegible] per cent from 45.[illegible]m ton in 1988 to 49.9m ton in 1989. Apparent consumption during crop year 1989 was 42.3m ton, about 10.6 per cent more than the 1988 level of 38.3m ton.

According to statistics collected by the Bureau, phosphate rock exports for crop year 1989 amounted to 8.5m ton, an increase of about seven per cent on the 8m ton exported in crop year 1988. The Bureau of Mines says the value of exports has risen from $24.06/ton to $27.38/ton fob mine over the same period.

However, the US Bureau of the Census claims that phosphate rock exports for crop year 1989 [illegible] ton.

Excluding imports from Canada and Israel, as reported by the Bureau of the Census, the US imported approximately 970,000 ton of phosphate rock during crop year 1989, chiefly from Morocco. Imports from the Netherlands Antilles and the rest of the world amounted to less than one per cent of the total.

ASIAN PLAYERS MULL PRICE DOWNTURN

A market glut [illegible] the South East Asian [illegible]

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Telex: 011-6451 MBSC IN, 011-4220 FIRE IN

suffer low prices by the mid-ninet the massive industry expansion rently being planned for the region ahead.

At present 25 to 30 per cent of w demands for several major petroch icals and polyolefins can be attrib to South East Asia, and a signific amount of this is imported from e where. Although there has bee decline in Asian prices for petroche icals over the last year, countries aro the Pacific Rim evidently feel confid enough to plan a substantial amoun petrochemical development.

However, according to Mars Frank, president and managing direc of Chem Systems, increases in natio capacity levels, particularly in Japan a South Korea, could result in a mass surplus of ethylene in the area. There about 28 olefin complexes operating South East Asia, 15 of which are locat in Japan. Present capacity added to t of the planned facilities could bring et ylene production to around 18.1m. to year by the mid 1990s, 4m ton/ye above the projected South East As demand for 1995.

Frank observes that such a surplus ethylene would have to be convert into derivatives. Moreover, if domest markets were unable to contain the su ply, these derivatives would then exported to other countries in the regio

He claimed this process would resu in prices being set as low as necessa in order to move the products. Th might result in producers in areas wi high freight costs being unable to com pete and therefore being forced to wit draw from the market.

Another problem could arise fro anticipated shortage of naphtha. Most the olefins complexes in the region it as a feedstock and may find the selves in competition with gasoline a aromatics facilities for available pr duct.

Biotechnology

EILS VACCINE
E

ers at the Max-Planck-
Biologie in Tubingin, West
elieve they have discovered
that will enable production
er vaccines." The scientists
cently that a system of stim-
ytotoxic T lymphocytes
essential in the immune
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ly, CTLs recognize fragments
roteins so it was thought that
peptides could mimic this
Researchers discovered, how-
approach does not work.

est German group, led by Hans
ammensee, claims to have
way round this problem. By
parts of an E.Coli protein to
influenza virus peptides, CTLs
ctively stimulated. "This tech-
ows particular promise in the
f vaccines."

theless, Rammensee remains
in his optimism claiming
ork on other viruses is required
as proof that it will work in
He believes the technique may
nded to provide protection
non-viral pathogens such as

EAN DRUG FIRMS TO RESOURCES

medium-sized European drug
ies, Merckle of West Germany,
iapparelli of Italy and Lafon of
have agreed to pool resources
lop and market products in the
r 1992.

move should enable them to
more effectively with the large multinationals that are expected to benefit from the creation of the single Euro pean market. The three have total sales of $410/m/year.

SKB MOVE ON HEART DRUGS

Pharmaceutical Transnational Smith-Kline Beecham (SKB) is linking up with T Cell Sciences, a US medical diagnostics firm, to develop and market a drug used to limit heart attack damage. T Cell Sciences has licensed rights to the drug, complement inhibitor protein, from Johns Hopkins University in Baltimore.

Under the terms of the agreement, SKB will provide $10-12m for T Cell Sciences to conduct the remaining preclinical trials over the next 12 to 18 months.

Moreover, SKB will assume responsibility for the clinical trials and regulatory approval of the drug. In return, SKB will receive exclusive marketing rights worldwide with the exception of the US, Canada and Japan.

Complement inhibitor protein may prevent the damage to heart tissue that occurs following the restoration of blood flow after a heart attack. Initial studies have shown the drug to reduce significantly the extent of such tissue damage.

According to an SKB spokesman, the drug may also limit tissue death caused by other diseases including strokes, adult respiratory distress syndrome and autoimmune diseases. These may represent future targets for similar compounds.

Meanwhile, the US Food and Drug Administration has granted SKB a licence to manufacture and market the thrombolytic drug Eminase, following a review of the clinical trial results. The drug has been available in the UK since May 1989. Eminase is a blood clot dissolving drug used to treat heart attack victims.

WELLCOME TESTS NEW SUNSCREEN

Burroughs Wellcome is test marketing an innovative sunscreen which boasts of a broader spectrum of ultraviolet A and B absorption than existing products. If successful, it is expected to form the basis of a new range of otc products.

Most existing sunscreens are effective against UB-B radiation only. The new product, obtained under exclusive licence from Herbert Laboratories, a division of Allergan, contains avobenzone, a new chemical absorber effective against UV-A radiation. This is combined with the more conventional UV-B absorber, Padimate-O.

Because of the new chemical formulation, the sunscreen is believed to be the first in the US to have required approval from the US Food and Drug Administration.

CANADIAN DECLINE

Canadian production levels for most commodity chemicals and resins continue to decline, as the downturn in the industry which began towards the end of 1988 threatens to continue into 1990.

Although a few sections of the industry are still operating at close to capacity levels, there has been a substantial decrease in overall production utilization rates.

At 66,700 ton, August's production levels of low density polyethylene (ldPE) and linear low density polyethylene (lldPE) represented only slightly over 60 per cent of January's production levels.

Environment

U.K. CHEMICAL INDUSTRY WELCOMES "GREEN BILL"

The UK government's proposed environmental protection, or "green" bill, is expected to be published shortly. As outlined in the Queen's parliamentary opening speech, the bill is expected to contain the widest-ranging environmental legislation ever seen in the U.K. For the chemical industry, attention focusses on three key aspects: integrated pollution control; reform of the waste disposal law; and control of the release of genetically manipulated organisms. The Bill will undoubtedly prove costly. Not withstanding, it has the backing, in principle, of the UK's Chemical Industry Association (CIA).

Of an expected 130 clauses, one-fifth are thought to relate to integrated pollution control. Under the far-reaching proposals, only one process consent will be required for all aspects of pollution, whether to air, water or land. Initially, because of resource funding, integrated pollution control will only apply to 10 per cent of all manufacturing sites. But this is expected to include all major UK chemical industry sites.

All new plants will be required to use BATNEEC (best available technology not entailing excessive costs) to limit emissions. All existing operations are likely to be brought under the same regime within five years. The CIA claims the measures will be the most stringent in the world and could lead to "severe rationalization."

In particular, the association voices concern for speciality chemical producers where protracted authorization procedures could result in commercial disadvantages. Moves are afoot to authorize the plant, rather than the specifics of the process. "It is a case of getting something from [illegible] to both the controls imposed and to data on the emissions actually occurring, so increasing the likelihood of independent enforcement of the controls. The CIA is supportive of information registers and better process descriptions to allow better appreciation of industry. But the association places emphasis on interpretation by regulators, rather than "swamping the system with raw data."

Reform of the waste disposal law is set to impose a "duty of care" on industry to select responsible disposal contractors. The main impact is likely to be a tightening up of the existing system of waste disposal licensing, and involvement of local authorities in waste disposal operations. Other issues to be addressed include a tightening up of import/export controls, and the problems of existing contamination of land, where clean up costs — as US Superfund experience has shown — can be enormous.

One of the more contentious aspects will be regulations on the deliberate release of genetically manipulated organisms into the environment. Special consents will be required from the secretary of state. The CIA is concerned that government resources will be insufficient to get authorizations through, possibly forcing production abroad. Despite its breadth and controversial nature, the Bill is expected to pass through the various committee stages early in the new year and receive Royal Assent in the summer months.

GREEN LIGHT FOR EC ENVIRONMENT AGENCY

Formation of the long-awaited European Environment Agency was agreed by the twelve EC member states recently. The agency could be functional by January 1991 if it gets rapid and final approval from the European parliament, the EC's environment [illegible]

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about new projects

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ral gas reserves.

The plastics venture is intended to be in operation by 1993.

BP proposed the idea some time ago, touting its position as a world leader in polyethylene technology. Other approaches were made by as many as nine companies from the US, Japan and Taiwan, industry sources say.

The premier's announcement was refuted, shortly after it was made, by a federal government statement in Kuala Lumpur. The trade and industry ministry insisted no final decision has been made and that various proposals are still being considered. A decision is expected shortly, and "once it is approved the ministry will provide details."

Exxon proposed an $800m "world-class" plant for the Trengganu site in August 1988. Its plans called for an output of 450,000 ton/year of ethylene and a similar amount of polyethylene. Exxon's proposal included the formation of a 50:50 joint venture with Petronas. Much of the output would have been destined for export to the Asia-Pacific region.

BP has about $40m invested in Malaysia and says it intends to increase that by about $7m/year over the next few years, but most of its activity is in oil exploration.

The company's former Malaysian managing director, Stephen Pettit, said on departing in July last, that BP sees polyethylene as "a strategic business and we see Malaysia as an interesting opportunity. Malaysia has competitive feedstocks. Geographically it is well placed in the region in terms of marketing. Overall, it is a good place to invest."

CIBA-GEIGY IN BRAZIL

Ciba-Geigy has approved a $150m investment programme to be carried out in Brazil over the next three years, this will increase the company's investment rate from $35m to $50m/year.

This year the group established new headquarters in Sao Paulo City and in 1992 plans to build a $10m, 8,000 ton/year herbicides unit at Camacari, Bahia state.

Chairman Norbert Gmur also revealed plans for a $14m alkyl phenols unit which is scheduled for completion by 1992. Other plans include a series of minor expansions and debottleneckings.

BASF INVITES BIDS FOR ANTWERP CRACKER

BASF has invited two contractors

URIC ACID Rs. 6500/kg
PATTON & READERS REAGENT Rs. 30/5gm.
KINETINE Rs. 100/gm.
* Rs. 150/10gm. * BROMO CRESOL GREEN Rs. 150/10gm.
* BOVINE ALBUMINE FRACTION - V Rs. 110/10gm.
*Quantity Orders with Advance Draft
Contact
ROMALI
P.B. [illegible] Bombay 400 [illegible]
* RATANLAL & CO.
[illegible]

Linde and Technip/KTI, to consider undertaking the DM1.25bn ($671m) ethylene cracker project in Antwerp, Belgium. BASF has asked groups to come up with detailed engineering and turn-key lump sum offers. KTI seems to be taking an interest in the project, since two of its representatives in the Netherlands, Leo Visser and Frans Duim, were at BASF recently to discuss the proposals. Despite this, industry sources suggest that Linde is likely to emerge as the victor. The company is under orders from BASF to remain silent on the subject.

The ethylene cracker will start up late 1993 and will be up to full production, put at some 600,000 ton/year, in early 1994. Eventually all the production will be used by BASF for downstream production. However, before then some ethylene from the new plant will be available on the market.

PIC PLANS TO BOOST ITS PP PRODUCTION

Kuwait's Petrochemical Industries Company PIC is to boost polypropylene production at its Shuaiba plant by a further 20,000 ton/year to 100,000 ton/year. The plant is scheduled to go on stream in 1992/93. Meanwhile, PIC is reconsidering plans to revive its ethylene cracker at Shuaiba. The plant, which received approval in 1982, was cancelled later during the same year.

Sources confirm the company is seeking information from international companies, concerning petrochemical production technology. If the $2bn project goes ahead it is expected to manufacture at least 500,000 ton/year of polypropylene, ethylene glycol and styrene from semi-process natural gas and domestic refineries.

ELEKEIROZ TO BOOST SALES THROUGH $500M EXPANSION

Brazil's Elekeiroz, the chemicals holding company of Itausa, has detailed plans for a $500m investment, which is to take place over the next five years. Through the move the company hopes to increase its predicted $128m turnover for 1989 to some $400m-$500m from 1995 onwards.

Elekeiroz' chairman, Cezar Huidoro says, to date, $300m in investments have been identified and the group plans to continue its strategy of investing in large scale plants for technology added products.

The group will either invest in its two controlled companies, Productos Quimicos Elekeiroz and Elekeiroz de Nordeste, or through joint ventures. Included are plans for the 50/50 Ciek partnership, with Ciquine. The two companies, which have invested $168m on the Camacari-based project, which is turn includes a 20,000 ton/year maleic anhydride plant, will use Mitsubishi technology.

The plant is scheduled to go on stream in 1992 and is expected to be of a large enough capacity to meet the predicted Brazilian demand of 24,000 ton/year. Another Ciek project, due on stream 1992 at a cost of $120m, will manufacture 25,000 ton/year of acrylic acid and 31,000 ton/year of acrylates.

Meanwhile, Huidoro says 1992 is clearly a decisive year for Elekeiroz as it is due to start up one of its most important projects.

At Camacari, plans are underway for Elekeiroz de Nordeste to build a complex for 80,000 ton/year butyraldehyde, 25,000 ton/year butanol and 35,000 ton/year of octanol.

PETKIM DEBOTTLENECKS PLANTS

Petkim, Turkey's state-owned petrochemicals company, has selected the firms which will conduct preliminary studies for the debottlenecking of eight units operated by its subsidiaries, Alpet and Yarpet. The companies invited participate in the $75m expansion those which were involved in the or inal construction.

Dr. Faruk Yagiz, Petkim gen manager, said the press : "Petkim intending to expand a number of pla at both sites. Preparation of proc design packages are almost complet In some plants, the engineering co tracts are already signed. Since this an expansion that covers several tec nical aspects, it was decided to conta the original licensor and engineeri companies for each plant."

Simon Carves will be responsible raising the output of low density po yethylene at Alpet from 175,000 ton year to 190,000 ton/year. Japan's Mits Petrochemical will increase hdPE 60,000 ton/year from 44,000 ton/ye Badger is to increase acrylonitri output to 92,000 ton/year from 77,0 ton/year; Solvay and CTIP are seekin to up PVC to 130,000 ton/year fro 105,000 ton/year, and VCM to 132,0 ton/year from the existing 120,000 ton year; Stone & Webster is raising et ylene output to 400,000 ton/year fro 350,000 ton/year.

Capacity increases at Yarpet a unlikely to be as dramatic. Finatech an Litwin are to raise PS capacity som 6,000 ton/year to 24,000 ton/year, whil ICI and Solvay are to expand the PV unit's output to 62,000 ton/year fro 47,000 ton/year.

BANAGAS MOVES ON PP, MTB

Bahrain National Gas Co. (Banagas is putting the finishing touches to $365m plan for world scale polypro lene and methyl tertiary butyl eth facilities. The units will use LPG fee stock and, once approval is granted the government, could be operative 1992.

Chem Systems International completed a technoeconomic feasi

anagas looking at a number
for the company. Banagas is
o present its findings within
v months to the Bahrain gov-
or approval.

isaged that the plant will use
enation technologies to pro-
propylene from propane and
om butane. A number of com-
e believed to have this tech-
lthough the leaders are UOP
roducts. Indeed, the technolo-
nging to these two companies
g evaluated by Himont, the
op PP producer.

cision has yet been made on the
s of the plants although figures
180,000 ton/year for MTBE
000 ton/year for PP have been

MTBE demand rising fast in the
d world, it is likely the gaso-
tive will head west, while PP
ad eastwards. Banagas is
to have contacted seven firms
equalification for project man-
consultancy.

NVEILS PLANS FOR SPE-
Y UNIT

Corporation has anounced it is
a new speciality isocyanates
its Lake Charles, Louisiana
. The plant is scheduled to go
ation by mid 1991 and will be
to have a top capacity of
on/year, and will use in-house
gy.

as been producing speciality
isocyanates at a pilot plant at
harles since January last and
s to consolidate its presence in
ket and complement its existing
hanes products.

company's chemicals group
t and an Olin executive vice
t, Robert Yohe, said: "Based on
ess of our semi-works we have
decided to speed up on plans for a full-scale facility. This will enable us to take advantage of the rapid growth in the automotive and industrial coatings markets, where we already enjoy a leading position."

The plant will produce hexamethylene diisocyanate (HDI) biuret and trimer, isophorone diisocyanate (IPDI), hydrogenated methylene diisocyanate (H12MDI) and octadecyl isocyanate (ODI).

The company currently supplies these from its semi-works, but believes a full scale US plant will provide an assured supply that is less susceptible to global fluctuations.

Olin is the second largest producer of TDI in the US and is a major supplier of speciality polyether polyols.

BRAZIL BOOSTS ACRYLATES CAPACITY

Brazil's capacity for production of acrylates has been boosted by Metacril's announcement that its $10m plant is to begin production of methyl and ethyl acrylate.

The Bahia-based company formerly produced 6,000 ton/year of the chemicals but lost this capacity after an explosion in December 1987. In the meantime, Metacril has had to use imports to satisfy some 40 per cent of a total domestic demand which has grown to around 12,000 ton/year.

The new plant will be able to produce up to 10,000 ton/year, and the company plans to invest a further $5m to double current production capacity. To achieve this, Metacril is depending on its supplier of acrylonitrile raw material, Acrinor-Acronitrila do Nordeste, to double its production to 150,000 ton/year by the end of 1991.

Oxiquimica, Metacril's rival, also plans to begin producing acrylates and acrylic acid. The joint venture between paints and varnishes producer, Renner Hermann and Oxiteno do Nordeste, received a $24m loan from the National Development Bank (BNDES) towards a $110m project aimed at producing 40,000 ton/year of acrylic acid and 43,000 ton/year of acrylates. The plant will be located at the Triunfo petrochemicals complex in Rio Grande do Sul, and use technology under licence from Mitsubishi.

At present, Brazil lacks acrylic acid capacity, although Ciek has been granted a licence to produce both this and acrylates at the Itaguai complex in the state of Rio de Janeiro.

AQUINO REMOVES PLANT OBSTACLES

The last of a series of obstacles has been removed, clearing the way for the Taiwan-backed petrochemicals project in the Philippines to get underway. The breakthrough came after Philippines president Corazon Aquino signed a law abolishing a 48 per cent tax on naphtha and the supreme court in Manila threw out objections to the project.

Meanwhile, Luzon Petrochemical Corp. (LPC) says construction on the $360m plant will commence in the first quarter of 1990. The cracker will have an output of 230,000 ton/year of ethylene, which will be converted into 140,000 ton/year of polyethylene and 110,000 ton/year of polypropylene, all of which is now imported by the Philippines.

LPC, which is 60 per cent owned by USI Far East Corporation, said its original partner, China General Plastics Corporation quit the venture a month ago due to continuous delays in starting the plant.

Meanwhile, USI Far East has been seeking new partners and confirmed that the International Finance Corporation has shown some interest in the project.

News from Japan

UBE JOINS SANKYO FOR DRUG DEVELOPMENT, CLINICAL TESTS

Ube Industries, Ltd. and Sankyo Company – Japan's 2nd-largest drug maker – have teamed up with each other for development of therapeutic products. Under the agreement, Ube will undertake synthesis of new substances such as drug ingredients and their manufacture in bulk, while Sankyo will carry out their clinical testing, formulation and marketing.

The first candidate as a drug covered by the agreement is an antihypertensive agent featuring a long period of action developed by Ube (code: CS-905). The agent has recently been put into clinical testing.

Behind this agreement is the coincidence of Ube's intention of advancing into drug business on a full scale and Sankyo's interest in expanding its line-up of new drugs. Under the agreement, Sankyo has begun clinical tests on the new agent. Sankyo will also advise Ube on potential substances as drug intermediates.

CS-905 is a dihydropyridine-based calcium antagonist having the effect of reducing blood pressure, with one oral dosage a day for a longer period of time than in the case of conventional drugs. In addition, it has three advantages: (1) slight effect for the [illegible] (2) [illegible] and (3) good [illegible]

[illegible]

antibiotics and antibacterial agents.

For development of such drugs, Sankyo will offer Ube [illegible] and Ube will carry out R&D work for synthesis of intermediates of potential drugs in line with Sankyo's proposal.

TOSOH AKZO TEAMS UP WITH FRENCH FIRM FOR ORGANIC-SYNTHESIS BUSINESS

In a bid to build up organic-synthesis-intermediates operations, Tosoh Akzo Corp. has tied up with PCAS (France) for mutual technical exchange. Based on the agreement, the Japanese company plans to study the feasibility of domestically producing PCAS products.

PCAS – affiliated with Akzo NV (Netherlands) – is a special maker of organic intermediates for pharmaceuticals, agrochemicals, photochemicals and additives. The company has unique technologies in the organic synthesis field.

Tosoh Akzo inaugurated two years ago its organic metal-applied organic-synthesis(intermediates) business. The company is engaged mainly in synthesis operations on a commission basis using a multipurpose plant for ultralow-temperature organic synthesis.

Organic metal-applied ultralow-temperature synthesis technology owned by the company features a high yield rate and [illegible]

[illegible]

Rayon is probing the possibility of supplying products to a wider range of clients, including American and European manufacturers, as the next step. It says that it has only been exporting products from Japan to the United States and Europe until now but that the establishment of production and sales bases in the United States will make it possible to stabilize supply and improve technological service drastically. The company aims at bringing new facilities into full operation within two years and taking the next step for expansion as early as possible.

Mitsubishi Rayon is one of the major manufacturers of acrylic toning resin, which uses methyl methacrylate (MMA) monomer as its principal starting material. This kind of resin is used as a raw material for a wide range of items, such as paint, ink, and adhesives. Japanese manufacturers of resin for toner form a group in the chemical [illegible], together with Fujikura Chemical Industries, Sanyo Chemical Industries, and Mitsui Toatsu Chemicals. In the case of duplicators, Japanese manufacturers are dominant in most of the world market. As a result, the weight of overseas production is increasing rapidly. Accordingly, competition among manufacturers of resin for toner is stiffening throughout the world.

Fujikura Chemical Industries has built production facilities in the United States in co-operation with Rohm & Haas Co. Mitsui Toatsu Chemicals, too, has set up a sales company in the States with a plan to start production in that country in a tie-up with [illegible]. Mitsubishi Rayon is the second Japanese company [illegible] in the United States [illegible] the first [illegible] United States [illegible]. The new [illegible] in the United States will be the [illegible] after those of [illegible] (MRS) [illegible] (CPP) film [illegible]

[illegible] high-class [illegible]

SOLE MAKER OF POTASSIUM TITANATE WHISKERS COMPLETES NEW PLANT

Otsuka Chemical Co. has completed a 1,200 kg/year plant for potassium titanate whiskers at its Tokushima factory and it will be put into regular operation by the end of the year. The plant is designed to produce either conventional-type whiskers ("Tismo D") or an improved version of the whiskers ("Tismo N").

Tismo N has a prominent advantage in that it is in an almost ideal crystalline state and it has the molecular structure of "almost pure" $K_2O \cdot 6TiO_2$ resulting in a neutral pH state, whereas the conventional type of Tismo D contains such "impure" crystals as $K_2O \cdot 4TiO_2$ and $K_2 \cdot 8TiO_2$. The company says that the new type thus has a wider application range and will find new markets for use as a reinforcing material for fiber-reinforced metals and ceramics and super engineering plastics.

The completion of the new plant brings Otsuka's combined production capacity for potassium titanate whiskers up to 3,600 t/y. On the other hand, its joint venture — Japan Whisker Co. —with Toho Titanium Co. and Marubeni & Co. has recently begun producing "Tofica" anti-abrasion materials to be mixed with thermosetting resins.

DAIICHI TO INVEST [illegible] BILLION FOR DRUG R&D PLANT EXPANSION BY [illegible]

Daiichi Pharmaceutical Co. has [illegible] billion.

The firm aims at [illegible] R&D setup and expanding production capacity [illegible] product range calls for investment of ¥23 billion for construction of new research wings at its laboratories in Tokyo, ¥20 billion in additional construction and improvement of new bulk-pharmaceutical facilities, ¥7 billion in construction of a distribution center and welfare facilities for employees, and ¥19 billion in subsidiaries.

Under the plan, the Tokyo research laboratories will be substantially expanded. A 14-storey central wing with a total floor space of 17,420 m^2 is now being built using an investment of ¥6.5 billion with completion slated for next fall. Information related to the company's clinical tests and R&D activities will be collected and processed there in future. Then ¥5 billion will be invested for construction of the No.9 research wing on the site of the Tokyo laboratories with completion scheduled for either the 1990 business year or the 1991 one.

Plant construction will be for "DR-3355" antibacterial agent (under phase-III) clinical tests and likely to be marketed in 1993) and "DP-1904" antiplatelet agent (under phase-II clinical tests and likely to be marketed in 1995). Construction is scheduled to start in 1990 for the former and in 1991 for the latter.

GUIDELINE FOR FOODS CONTAINING NUCLEOPROTEIN TO BE ESTABLISHED

Japan Health Food Association has started a working group within itself to map out a guideline for "nucleoprotein-contained products." Back of this is the increasing use in Japan of products containing nucleoproteins -- milt of fishes and beer yeasts, etc. -- in large amounts and acting as health-care food additives. The group will work out regulations for such products to be followed voluntarily by their makers with respect to the amount to be added to foodstuffs, and their processing conditions and extracting methods, etc., in order to specify "health-care foodstuffs containing nucleoproteins" for consumers' convenience.

Nucleoproteins are compound proteins consisting of nucleic acid linked to protein mostly found in the nuclei of living cells. In particular, they collectively occur in the milt of salmon and herrings and the testes of bovine, swine and chickens as well as beer and bread yeast. The working group consisting of experts from 11 leading Japanese food-additive makers is now considering specifying foods containing nucleoprotein and nucleic acid at a rate of more than 10% as "health-care foods.".

It is believed that nucleic acid and nucleoprotein act to rejuvenate the skin, prevent the hair from falling out and greying, prevent arteriosclerosis and hypertension, and improve the condition of those suffering from the after-effects of cerebral apoplexy and softening of the brain, etc.

ASAHI CHEMICAL TO ADVANCE INTO CLINICAL REAGENT BUSINESS

Asahi Chemical Industry Co. has decided to branch out into the clinical-reagent field on a full scale by the end of next year. It has already developed new monoclonal antibody reagents for detecting liver cancer and cirrhosis and has put them into clinical testing in Japan. It is also working on commercial development of a number of clinical reagents -- some for tumors in particular.

The company intends to take positive measures for full-fledged operations in this field by establishing partnerships with clinical-reagent makers in Japan and abroad as well as pushing M&A tactics aimed at Japanese and foreign firms. This plan is in line with the company's basic strategy aimed at becoming an all-around medical company involved with therapeutic products, medical instruments and clinical reagents. It is already implementing R work for drugs for adult diseases, a cancer agents and antibiotic interm iates, while its subsidiary -- As Medical Co. -- is commercializing a ificial organs and NMR (nucle magnetic resonance) systems, etc.

To expand its medical-related bu nesses, the company is intent on increa ing capital investment in its affilia Toyo Jozo Co. to strengthen the pa nership with it for R&D on and ma keting of diagnostic and therapeu products.

SHOWA DENKO'S JAPAN, U.S. GRAPHITE PRODUCTION BASE UNDER STABLE OPERATION

Showa Denko's artificial-graphite electrode plant in South Carolina, th U.S. is operating smoothly, and a ba ance has been established with th Omachi Plant in Japan. As a result, th original goal of keeping the export ra below the 50% level has been realize Profits, too, are showing a favorab trend. Showa Denko Carbon's Sou Carolina Plant in the U.S. has been i full operation since July last year. Als in the January~June period of this yea the operation rate remained as high a more than 90%. It is expected that th rate will remain at a similar level in th July~December period of this year a well. The company has secured marke for its exports in Central and South America and Europe as well as in the U.S. As a result, the Omachi Plant which is its production base in Japa has succeeded in expanding its produc tion to 40,~45,000 tons a year, relyin mainly on domestic demand.

Until now the export ratio has bee more than 60% in the case of the firm electrode business. However, it is s that a supply balance has been esta lished between Japan and the U.S. a that it has become possible to exp that the ratio of exports from Japan w be reduced to the original goal of le than 50% on a stabilized basis.

New developments from Japan

ING CURE FOR ALZ- DISEASE DEVELOPED:

o. has developed and started
an acetylcholine-esterase
nhibitor (code name: E2020)
as a promising cure for Alz-
sease. Related research results
ounced at the second interna-
eting on Alzheimer/Parkinson
The product will be subjected
l tests in the United States next

ew agent has the piperidine-
oride structure. On an invitro
company claims, it has higher
ty for AChE than tetrahydro-
ridine and physostigmine —
er development in the States —
animal tests employing rats, the
did not work on AChE exist-
ripheral nerves but inhibited the
s of AChE within the brain. The
oncentration in the rat brain was
ight times higher than that in
blood. All these phenomena
at the product accumulates in
and efficiently prohibit AChE
s.

ompany intends to begin clin-
on the new product in the U.S.
ope, where Alzheimer disease
a greater extent than in Japan.
er disease is accompanied by
reaks, amyloid deposition, dis-
cholinergic neurons and trans-
n of Alzheimer fibrils, all of
re caused within the cerebral
Cures designed to correct dis-
cholinergic neurons are being
ngly developed all over the
nce substances capable of inhib-
ChE functions have produced
ble effects in the U.S.

REE PRODUCTION OD FOR URETHANE DEVELOPED

o Chemical Industries, Ltd. has developed polyether [illegible] suitable production of low-hardness flexible polyurethane foam. In a hot-mold method, it is possible to process the new material into polyurethane foam - which has the same properties as those of conventional products - without using chlorofluorocarbon (CFC). The new product can be subjected to processing with existing hot-mold equipment.

Polyurethane foam produced from the new material has softness and cushioning properties, both of which are required for the seat backs of automobiles. The company is striving to pioneer other types of CFC-free polyether polyol used as raw material for HR foam and rigid polyurethane foam. It has hitherto commercialized various types of polyether polyol since it began to commercialize the product in 1961.

In Japan, annual demand for flexible polyurethane foam produced by means of a hot-mold process stands at roughly 50,000 tons and related demand for polyether polyol reaches about 33,000 tons. There is a worldwide need for CFC-free production of polyurethane foam in response to the campaign for eliminating CFC use.

There are two methods for eliminating CFC from a hot-mold process. One is aimed at accelerating foam production by increasing the use of water employed as a foaming agent, thereby producing polyurethane foam having low-level foam density and hardness.

The other is intended to accelerate foam production by raising the temperature of a mold when raw material is fed thereto, thus producing the abovementioned product.

Their drawbacks are, however, that the former is incapable of producing polyurethane foam with the desired hardness and the latter often produces cracks in the polyurethane foam thereby produced.

PRODUCTION FACILITIES FOR 8-INCH SILICON WAFERS LINED UP

Japan's semiconductor industry is aggressively pursuing increasing of the size of silicon wafers from six to eight inches, reflecting moves toward commercializing high-density chips having larger capacity than 16M-DRAM chips do. As a matter of fact, production facilities for 8-inch wafers have been put on the market one after another.

Kokusai Electric Co. is intent on marketing DJ-805J vertical-type CVD equipment suitable for production of 8-inch wafers. Tokyo Electron Ltd. is trying to catch up with Kokusai Electric by promoting sales of VDF-615 equipment.

With regard to CVD equipment, it is necessary to enlarge the diameter of furnace-core pipes. To this end, Toshiba Ceramics Co. has developed a quartz furnace-core pipe in expectation of demand increase for the product itself.

Etching equipment capable of forming smaller patterns on IC chips will grow in importance. Anelva Corp. and Sumitomo Metal Industries, Ltd. have provided ECR-6011 and ER5500 equipment, respectively, for use in commercial production of 8-inch wafers.

Stepper makers have not ignored the abovementioned moves. Nikon's NSR-177/5G7A equipment and Canon's FPA-1550/NiV-W equipment are usually applied to production of 6-inch wafers but are also usable for 8-inch wafers if they are partly modified.

Ulvac Corporation -- a major supplier of sputtering equipment -- has begun to market its MLX-30 equipment suitable for production of 8-inch wafers.

The line-up production facilities for 8-inch wafers has thus been enriched but there is still elbow room for further improving the yield ratio for the products. It will be interesting to see when domestic semiconductor makers introduce a production line for 8-inch wafers, since they are still cautious about starting their production.

NEW MATERIAL SAID TO PROVIDE ULTRAHIGH-LEVEL VACUUM STATE

National Research Institute for Metals has developed technology for producing hexagonal boron nitride (BN) on the surface of SUS304 stainless steel; it has thus regained confidence with regard to development of material for vacuum vessels, which provide an ultralow-pressure atmosphere (ultrahigh-level vacuum state) indispensable to "material art" -- technology for designing novel materials in accordance with user needs.

In the new technology, small pieces of boron nitride are placed on a plate of the said steel and high-frequency plasma is applied thereupon, thus producing thin film on the steel base: the film is then heated to 300°C in a vacuum so that it can uniformly cover the steel base.

Even when exposed to air for 24 hours, the film hardly adsorbs oxygen and carbon as is the case with BN film produced at higher temperature.

The institute claims that the technology will help coat the interior surface of conventional vacuum vessels with BN film, thereby making them usable under ultralow pressure.

The institute previously heated B/N-added SUS304 steel to 600°C, thus crystallizing BN film thereupon: the film also hardly adsorbs gas. This process, however, has the drawback that it reduces the strength of the steel base since [illegible] heated to too high a temperature.

An ultrahigh-level vacuum state (pressure: below 10^{-11} Pa) is needed for creating ultrapure materials and studies are being conducted on how to develop material for vacuum vessels designed to neither adsorb nor discharge gas.

RESEARCHERS SEEK TO DEVELOP EXTREMELY TINY MECHANICAL DEVICE

Researchers at both the Mechanical Engineering Laboratory and the National Research Laboratory of Metrology will embark on the development of an extremely tiny machine with a volumetric measure approximately one-thousandth that of the smallest such device (several cubic centimeters) in use today. The dimensions of the machine's structural components, which will be measured in sub-millimeters, attest to its microscopic size.

The Mechanical Engineering Laboratory will approach the design by attempting to miniaturize existing techniques, while the National Research Laboratory of Metrology will reportedly apply electron beam exposure devices and related IC technologies to the endeavour.

Successful development of a submillimeter-sized machine could have a major impact on medical and space exploration innovation. In the medical field, for example, a device this size could be injected into the human body to collect tissue, destroy cancerous cells, or perform a carrier function by incorporation into a drug delivery system.

In attempting to engineer such a device by drastically scaling down existing manufacturing existing methods, the Mechanical Engineering Laboratory currently faces two research issues related to processing technology.

The first is to observe destruction and deterioration phenomena near ma surfaces during mechanical processing and investigate the nece conditions for extremely fine micr chine processing.

The second involves high- microscopic particle and ion-inje processing, examining the in-fligh dition of high-speed particles researching the distribution conce tion of injected ions. Through actions, the laboratory hopes to sub tiate the basic principles under micromachine creation.

With regard to structural techno the lab will examine miniature sl part lubrication from the perspecti microtribology and build a proto module suitable for transmi extremely small motions. More researchers will conduct fluid co tion and nozzle tests in additi theory analysis in a basic test of m scopic fluid structures.

They will also carry out experim to confirm possible physical phen ena using a micro-actuator. Concern control technology, the lab will cond dynamic analyses of basic movem in the control of miniature operat structures, and define problems a necessary conditions for sensor mini turization and integration.

Meanwhile, the National Resea Laboratory of Metrology will emplo electron beam exposure devices a other equipment currently used in t manufacture of IC photomasks to car out tests on micro-machine eleme evaluate the accuracy of their constr tion and clarify the relationship betw engineering precision construc methodology and technology.

In addition, the lab will build a totype manufacturing device to cond scientific measurements on m machine element characteristics in to provide the most suitable design ditions.

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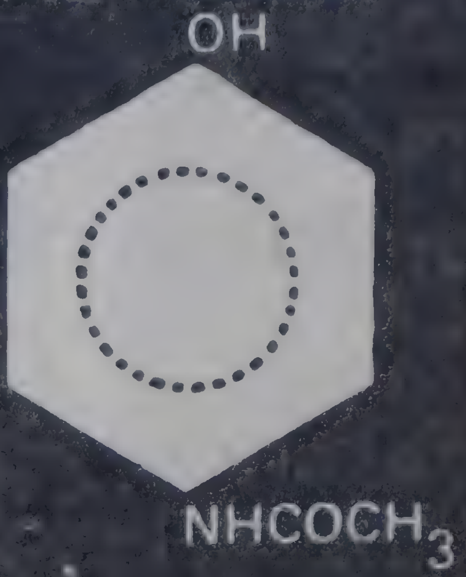

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ET INFORMATION

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	6.00
% Cl)	4.20

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Ortho Dichloro Benzene (ODCB)	1
OT Base	1
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Para Anisidine (PA local)	15
PNA	11
Para Cresidine (Imp.)	41
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Para Amino Acetanilide	19
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Delhi Market

DELHI: DEC. 29, (NNS) Caustic soda flakes suffered a set back and slumped by Rs. 30 at Rs. 475 per 50 kg in the Delhi chemicals market during last week, in view of accumulation of stock in market as well as fall in demand by consumers. Export demand was also negligible while stock and supply position was satisfactory. Soda ash drifted lower by Rs. 3/4 at Rs. 340/346 thanks to better supply and poor offtake. Soda bicarb ruled easy at Rs. 290/295 per katta.

As a result of negligible demand by consumers as well as comfortable stock position in the market, chalkolite, sulfolite and rangolite Germany dropped by Rs. 2 each at Rs. 64, Rs. 75 and Rs. 65 per kg respectively. It is noticeable that a fall of Rs. 15 was reported in its prices within a month. In the absence of demand from gur manufacturers due to heavy mist and severe winter, sodium hydrosulphite ruled quiet at its previous level of Rs. 34/36.50.

Tartaric acid France declined further by Rs. 10 at Rs. 13,700 per 50 kg in the absence of demand while tartaric acid Indian ruled quiet at Rs. 4,150 per 15 kg. In the absence of arrivals from Sambhol, Muradabad, Rampur, Amroha and Chandausi areas of U.P. as well as sustained demand by exporters, menthol medium and bold pushed up by Rs. 25/30 at Rs. 385 and Rs. 400 per kg. Menthol flake also advanced from Rs. 330 to Rs. 358 per kg in view of dwindling stock position. As a result of sustained demand from stockists and exporters, menthol oil looked up by Rs. 20 at Rs. 265/285. DMO moved up by Rs. 2 at Rs. 122.

Slack wax suffered a fall of Rs. 100 at Rs. 8,400 per tonne for want of support while paraffin wax remained quiet at Rs. 880 per 50 kg. Naphthalene balls being offered lower at Rs. 1,500 against Rs. 1,525 due to lack of buying interest. In the absence of demand from plastic and paint units, prices of titanium dioxide ruled easy at its last week levels. Demand was poor in dyes and colours due to severe winter.

(DELHI MARKET RATES AS ON DECEMBER 29, 1989)

Ammonia Bicarb (Per 25 Kg.)	140.00	Rangolite (Per Kg.)	65.00
Mercury (Per flask)	10,700.00	Tartaric acid (fmc) (50 Kg.)	13,700.00
Soda ash (Per bag)	340/346.00	Sulfolite (per Kg.)	75.00
Ammonium Chloride (50 Kg.)	110/180.00	Chalkolite (per Kg.)	64.00
Caustic soda flakes (50 Kg.)	475.00	DMO	122.00
Citric acid (Per 50 Kg.)	2,150/2,375.00	Boric acid Technical (Per 50 Kg.)	1,400.00
Stable Bleaching Powder Shriram (Per 25 Kg.)	100.00	Paraffin Wax (Per 50 Kg.)	880.00
Stable Bleaching Powder KC (Per 25 Kg.)	90.00	Tartaric Acid (Trishul Per 15 Kg.)	4,150.00
Stable Bleaching Powder Wamir (Per 25 Kg.)	90.00	Borax Granular (Per 50 Kg.)	835.00
Stable Bleaching Powder Modi (Per 25 Kg.)	92.00	Borax Crystal (Per 50 Kg.)	835.00
Sodium Bicarbonate (50 Kg.)	290/295.00	Sodium Nitrite (Per 50 Kg.)	800/900.00
Sodium Hydrosulphite (Per Kg.)	34/36.50	Sodium Nitrate (Per 50 Kg.)	450.00
		Camphor Thai (Per Kg.)	103.00
		Camphor Powder (Per Kg.)	93.00
		Menthol Bold (Per Kg.)	400.00
		Menthol Medium (Per Kg.)	385.00

Menthol Flake (Per Kg
Glycerine (Per Kg.)
Sodium Silicate (Per q
Hexamine (Per Kg.)
Acetic Acid Glacial (Pe
Copper Sulphate
(Per quintal)
Formic Acid (Per Kg.)
Formaldehyde (Per Kg
Hydrogen Peroxide (Pe
Calcium Carbonate
(Per Tonne)
Acid Slurry Soft (Per Kg
Acid Slurry Hard (Per K
Phosphoric Acid (Per S
Potassium Nitrate
(Per quintal)
Potassium Permangana
(Per 50 Kg.)
Sodium Bichromate
(Per 50 Kg.)
Trisodium Phosphate (S
Titanium Dioxide Anatas
Titanium Dioxide RC-82
Titanium Dioxide K-Bran
Titanium Dioxide RCR-2
Zinc Oxide
(Per metric tonne)
Phenol Carbolic Acid (Pe
Carbon Tetrachloride (Pe
Chloroform (Per Kg.)
Sodium Sulphate
(Per metric tonne)
Naphthalene Balls (Per 5

DYES & COLOURS

Naphthol AS
Naphthol ASG
Naphthol ASBS
Naphthol ASTR
Naphthol ASOL
Naphthol ASBO

DIRECT DYES

Black E. Conc
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Blue 2-B
Blue 2-B 225% (JNR)
Sky Blue FB
Basic Auramine
Basic Rhodamine
Basic Methylene Blue
Basic Violet
Basic Malachite Green
Acid Orange
Orange Red NC

Madras Market

ended with a
year that had
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upcoming up
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new units that
stream in the
ese are Manali
Petrochem-
ene glycol and
hemicals manufacturing MEK, Balmer Lawrie producing butylated hydroxy toluene and para tertiary butyl phenol, Kothari Sugars & Chemicals producing poly-butadiene based lubricants, Indian Additives Ltd. a subsidiary of MRL going for manufacture of speciality lubricants and so on. The outlook for the coming year is bright.

As for prices during the last week acetic acid prices came down further while there was a shortage of acetic anhydride. There has been no change in caustic soda prices. Large consignments of imported solvents especially methylene chloride, methanol, isopropanol, diethylene glycol have come forcing the indigenous prices down.

RKET RATES AS ON DECEMBER 30, 1989)

)	15.00
ase	
	4,000.00
	140.00
MT)	3,000.00
	30.00
)	8.50
	8.00
g.)	22.00
kgs)	225.00
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	18,800.00
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	18,800.00
ed	
	3,500.00
us	
	5,750.00
ted	
	6,000.00

Calcium Carbonate (Precipitated) (per MT)	5,000.00
Citric Acid (per kg)	48.00
Copper Sulphate (per kg)	24.00
Cresylic Acid 98-99% (per kg)	130.00
Pure Para Cresol 98% (per kg)	85.00
Meta Para Cresol 42% (per kg)	50.00
Formic Acid (per kg)	25.00
Formaldehyde (per kg)	8.00
Glue Flakes (per kg)	15.00
Glycerine I.W. (per kg)	51.00
Hydrosulphite of Soda (TCPL) (per kg)	37.00
Hydrosulphite of Soda (IDI) (per kg)	42.00
Hydrosulphite of Soda (BASF) (per kg)	42.00
Hexamine (per kg)	30.00
Hydrosupernil (per kg)	20.00
Hydrogen Peroxide (per kg)	31.00
Litharge (per kg)	40.00
Lead Acetate (per kg)	40.00
Magnesium Carbonate (per kg)	[illegible]
Magnesium Chloride (per kg)	3.50
Maleic Anhydride (per kg)	40.50
Menthol Crystals (per kg)	345.00
Oxalic Acid (per kg)	20.50
Paraffin Wax (per kg)	18.00
Potassium Bichromate (per kg)	38.00
Phosphoric Acid (per kg)	25.00
Polyvinyl Alcohol Powder (per kg)	100.00
Pentaerythritol (per kg)	51.00
Phthalic Anhydride (per kg)	36.00
Soda Ash (TAC) (per 75 kgs)	382.00
Soda Ash (TATA) (per 75 kgs)	382.00
Sodium Bicarbonate (TATA) (per 50 kgs)	175.00
Sodium Silicate (per MT)	3,500.00
Sodium Bichromate (per kg)	28.00
Sodium Nitrate (per kg)	8.00
Sodium Nitrite (per kg)	15.00
Sodium Sulphide Flakes (per kg)	14.00
Sodium Bisulphite (per kg)	4.50
Sodium Alginate (per kg)	225.00
Sodium Acetate (per kg)	7.00
Sodium Sulphate (Anhydrous) (per kg)	2.00
Titanium Dioxide (Anatase) (per kg)	75.00
Titanium Dioxide (Rutile) (per kg)	82.00
Trisodium Phosphate (per kg)	7.00
Urea (Technical) (per kg)	3.00
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Zinc Chloride Powder (per kg)	12.00
Zinc Sulphate (per kg)	7.00

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Diethylene Glycol (per kg)	42.00
Dichloroethane (per kg)	18.00
Di-octyl Phthalate (per kg)	46.00
Di-N-butyl Phthalate (per kg)	48.00
Ethyl Acetate (per kg)	22.00
Isopropyl Alcohol (per kg)	28.00
Methanol (per kg)	10.00
Methylene Chloride (per kg)	20.00
Methyl Ethyl Ketone (per kg)	38.00
Methyl Isobutyl Ketone (per kg)	40.00
Phenol (per kg)	36.00
Sorbitol (per kg)	15.00
Triethanolamine (per kg)	64.00
Trichloroethylene (per kg)	25.00
1-1-1 Trichloroethane (per kg)	29.00
Turpentine (per lit)	16.50
Toluene (per lit)	17.00
Xylene (per lit)	25.00

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(1)	(2)	(3)	(4)
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[illegible]	Yulius Fuchik (Russ) (V-335 W/B)	Transocean	Odessa; Ismail; Reni (U.S.S.R.); Russe; Bulgaria; Budapest (. Linz; Vienna (Austria); Bratislava (Czechoslovakia); Degge Regensburg (West Germany). (All ports on River Danube). at N/Q-PD & G-PD).
14/8	Bitola (Yug)	Oceanic	P. Said; Rijeka; Med. Ports. (PCL only).
[illegible]	Eagle Star	F.F.C.Co.	Colombo; Rangoon. (Carting at Timber Pond No. 1).
[illegible]	Uni Pioneer	Greenways	Colombo. (Carting at G/H Cotton Depot).
[illegible]	Together	Shara	Karachi (Afghanistan).
[illegible]	Eagle Star (V-025)(Cyp)	F.F.C. Co.	Penang; P. Kelang; Singapore; Bangkok; Jakarta (T. Priok); Manila; Busan; Keelung; Kaohsiung; Kobe; Yokohama; Na Osaka; Tokyo; Tsingtao; Dairen; Quangzhou; Whampoa; Sh Hongkong. (Carting at Timber Pond No. 1).
[illegible]	Bravo Sif	Marine Trans/	Singapore; Hongkong; Busan; Kobe; Tokyo; Djakarta. (Carting No. 5).
		M.C.S./	Far East & Japan Ports. (Carting at H.B. No. 4).
		Kamadip/	Far East & Japan Ports. (Carting at M.O.D. No. 3).
		Khemka	Singapore; Hongkong; Busan; Tokyo; Kobe. (Carting at W.B.
[illegible]	Uni Pioneer (V-420)(Pan)	Greenways	Singapore; Penang; Port Kelang; Bangkok; Djakarta; Surabaya; Cebu; Kaohsiung; Keelung; Osaka; Yokohama; Kobe; Shim Nagoya; Pusan; Hongkong. (Carting at G/H Cotton Depot).
[illegible]	Premier	P&O/I.M.E./ Killick	Singapore. (Carting at W.B. No. 5 for I.M.E.) (Carting at M. C.D. for Killick) (Carting at T.P. No. 4 for P&O).
[illegible]	Orient Express (V-007)	Transworld	P. Kelang; Penang; Keelung; Kaohsiung; Busan; Bangkok; Kob Manila; Djakarta. (Carting at CFS Cotton Avenue).
		N.L.S.	Far East; Japan and Chinese ports. (Carting at T.P. No. 4).
[illegible]	[illegible] (Yug)	[illegible]	Hongkong; Keelung; (Kaohsiung); Kobe; Yokohama; Tokyo; B (Carting at CFS Cotton Avenue for Containers only).
[illegible]	Green Valley	M.S.P.L.	Singapore. (Carting at P/Q-PD).
[illegible]	Eagle Star	F.F.C.Co.	Brisbane; Fremantle; Sydney; Melbourne; Adelaide. (Ctg. at T.P
[illegible]	Bravo Sif	M.C.S.	Sydney; Melbourne; Brisbane; Burnie; New Castle. (Carting at No. 4).
[illegible]	Premier ([illegible])(Pa)	I.M.E./	Sydney; Melbourne; Adelaide; Fremantle; Brisbane; Auckland; Wellington; Lyttelton. (Carting at Wadi Bunder No. 3).
		P&O/ Killick	Melbourne; Sydney; Brisbane; Adelaide; Fremantle; P. Hobart; Launceston; Burnie; P. Chalmers; Lyttelton; Christchurch; New Plymouth; Auckland; Wellington; Napier also Western S Papua; New Guinea; Solomon Island; American Samoa; Tong Caledonia; Rabaul; P. Villa. (Carting at T.P. No. 4 for P&O) at M-176/180 Cotton Depot for Killick).
[illegible]	Eagle Star (V-025)	F.F.C.Co.	Dubai; Sharjah; Abu Dhabi; Doha; Muscat; Dammam; Riyadh; Kuwait. (Carting at Timber Pond No.1).
[illegible]	Al Zahraa (Iraq)	Al Rafidain	Umm Qasr. (Carting at 12-VD).
[illegible]	Bravo Sif (V-026)	Kamadip	Dubai; Muscat; Abu Dhabi; Doha; Dammam; Bahrain; Kuwait. at M.O.D. No. 3).
[illegible]	Tina (V-42) (Cyp)	[illegible]	Dubai; Dammam; Kuwait; Bahrain; Riyadh; Abu Dhabi; Doha. at 14-VD for Containers).
[illegible]	Hafez (Iran)	J.M. Baxi	Bandar Abbas
[illegible]	Orient Express (V-007)(Pan)	Transworld	Sharjah; Dubai; Abu Dhabi; Ajman; Doha; Kuwait; Dammam; B Basrah; Syria and inland destinations in Gulf. (Carting at CFS Avenue).
		[illegible]	Dubai; Abu Dhabi; Bahrain; Doha; Muscat; Kuwait; Dammam. at M-176/180 Cotton Depot).
[illegible]	[illegible] (V-14) (Pan)	[illegible]	Dar Es Salaam & Mombasa (Direct); Kampala; Jinja; Tororo; [illegible] (Uganda); Kigali (Rwanda); Kitwe; Lusaka; Ndola Lilongwe; Blantyre (Malawi); Maputo; Zanzibar. (Ctg. at M.
		P&O	Mombasa; Dar Es Salaam (Direct); Beira; Maize and inland desti in East Africa. (Carting at Timber Pond No. 4).
[illegible]	Eagle Star (V-025)	F.F.C.Co.	Los Angeles (Harbour); Longbeach; San Francisco; Oakland; Seat Vancouver (B.C.); Portland; New York; Boston; Norfolk; Balt Charleston; Savannah; Miami; New Orleans; Houston; Montre Toronto; [illegible]; Chicago; Nashville; Atlanta; Philadelphia Milwaukee; Kansas City; Phoenix; Guam; Dallas; Cincinnati

(3)	(4)	(5)
	St. Louis; Cincinnati; Denver; Louisville; Memphis; Washington (D.C.); San Diego; Minneapolis; Indianapolis and Central American Ports; Honolulu (Carting at Timber Pond No.1).	
Marine Trans/	Boston; New York; Baltimore; Norfolk; Charleston; Port Everglades; Jacksonville; Galveston; Houston; Los Angeles; Toronto; Montreal; Philadelphia; Savannah; New Orleans; South and Central American Ports. (Carting at T.P. No. 3).	[illegible]
M.C.S./	Savannah; New York; Baltimore; Wilmington; Houston; Galveston; Los Angeles; Longbeach; Boston; Norfolk; Charleston; Jacksonville; Miami; Tampa; New Orleans; Providence; San Diego; Oakland; San Francisco; Stockton; Chicago; Detroit; Cleveland; Milwaukee; Columbus; Kansas City; Atlanta; Nashville; Dallas; Minneapolis (Carting at Hay Bunder No. 4).	
Ranadip	New York; (Elizabeth); Portsmouth (Norfolk); Baltimore; Charleston; Boston; Philadelphia; Houston; New Orleans; Jacksonville; Savannah; Wilmington (N.C.); Mobile; P. Everglades (Miami); Los Angeles (Longbeach); Oakland; Portland; Seattle; Anchorage; Montreal; Qubec; Ontario; Toronto; Via Halifax; Vancouver; Detroit. Also Caribbean & Mexican Ports. (Carting at M.O.D. No. 3).	
Greenways	New York; Newark; Baltimore; Charleston; New Orleans; Houston; Boston; Providence; (RI); Philadelphia; Norfolk; Savannah; Jacksonville; Wilmington; Miami; Montreal; Toronto; Bermuda; Los Angeles; Longbeach; Sanfrancisco; Oakland; San Diego; Stockton; Richmond; Almeida; Redwood City; Sacramento; Seattle; Portland; Vancouver (B.C.); Tacoma; Longview; Chicago; Dallas; Various inland destinations and Caribbean Ports. (Carting at G/H Cotton Depot).	[illegible]
Patvolk/P&O S.W. & Co./	S. American Ports. (Carting at Kalamboli for all).	[illegible]
Trident	New York; Norfolk; Savannah; Baltimore; Boston; Charleston; Houston.	
S.C.I.	New York; Baltimore; Savannah (Direct) and other inland destinations (Carting at Timber Pond No. 1).	13/1
C.M.B.	Norfolk; New York; Baltimore; Philadelphia; Charleston; Savannah; Houston; Miami; New Orleans; Via Antwerp; Montreal; Toronto; Halifax. (Carting at Kalamboli).	14/1
Killick	S. American Ports. (Carting at M-178/180 Cotton Depot).	13/1
Patvolk	Montreal & Toronto via Halifax; New York; Boston; Norfolk; Charleston; Houston; Savannah; Wilmington; Philadelphia; Baltimore; New Orleans; & FCL Chicago; Milwaukee; Atlanta; Dallas. (Carting at H.B. No. 5).	14/1
Transworld	Los Angeles; Longbeach; Sanfrancisco; Oakland; Seattle; Vancouver; New York; Boston; Toronto; Montreal; Philadelphia; Norfolk; Baltimore; Charleston; Savannah; Jacksonville; Miami; New Orleans; Houston. (Carting at CFS Cotton Avenue).	13/1
M.S.P.L.	Philadelphia; Baltimore; Norfolk; New Orleans; Houston; Savannah; New York. (Carting at P/Q-PD).	[illegible]
Oceanic	New York; Baltimore; Philadelphia; Chicago; Boston; Norfolk; Atlanta; Charleston; Savannah; Miami; Houston and other inland destinations in U.S. East Coast and S. American Ports. (Carting at Wadi Bunder No. 3).	[illegible]
Arebee	Lagos/Apapa; P. Harcourt; Abidjan; Tema; Takoradi; Monrovia; Lome; Freetown; Cotonou; Douala; Matadi. (Carting M. Jetha Cotton Depot).	[illegible]
Patvolk/P&O S.W.& Co.	West African Ports. (Carting at Kalamboli for all).	[illegible]
C.M.B.	Lagos; Abidjan; Lome; Douala; Matadi; Port Gentil; Pointe Noire; Nouakchott; Cotonou; Dakar; Luanda; Monrovia; Tema via Antwerp (Carting at Kalamboli).	[illegible]
Transworld	Monrovia; Lome; Lagos; Douala; Tema; Takoradi; Abidjan; San Pedro (Carting at CFS Cotton Avenue).	[illegible]

VESSELS DUE IN BOMBAY FOR IMPORT DISCHARGE

Due Date	Steamer's Name	Agents	From
13/1	Algerian Express	F.F.C. Co.	U.A.E.
14/1	Buzet	Oceanic	USA/Adriatic
17/1	CMB Enterprise (Nhava Sheva)	C.M.B.	U.K. Cont./U.S. Med./E. Africa
12/1	CMB Plantin (Nhava Sheva)	C.M.B.	U.K. Cont./U.S. Med. Ports.
12/1	Green Valley	M.S.P.L.	U.S.A.
10/1	Hoegh Cairn	Patvolk	U.S.A.
16/1	Ind. Faith	I.S.S.Co.	U.K. Cont.
15/1	Jag Yamuna	I.S.S.Co.	U.K. Cont.
10/1	Maribor	Depe	Far East
10/1	Olandia	Merzario/Samrat	U.K. Cont.
13/1	Vishva Yash	S.C.I.	U.K. Cont.
12/1	Yulius Fuchik (V-015)	Transocean	Russia/E. Europe

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Materials Imported

ASTIC MATERIALS IMPORTED BOMBAY

m 10.11.89 to 15.11.89)

: From Czechoslovakia:
Inds. Corpn., 125 MTs.,
5,120; Naresh Traders, 125
. 12,75,120; From Japan: Pro-
Trading Co., 36,000 Kgs.,
032; The Supreme Ind. Ltd., 16
. 2,20,492; From Saudi Arabia:
ntl., 17.15 MTs., Rs. 2,19,350;
l., 20,580 Kgs., Rs. 25,15,110;
ayan Plastic Inds., 24.75 MTs.,
,848; Vishal Plast Enterprises,
's., Rs. 9,44,135; From Yugo-
Bharech Overseas Corpn., 36
. 4,77,368; Ravi Intl., 63 MTs.,
,199.

: From FRG: Uniproducts
.td., 2 MTs., Rs. 90,721; From
.M. Thakkar & Co. Ltd., 165
. 20,28,140; Bharat Flexo Pro-
5.5 MTs., Rs. 2,09,888; From
abia: Leela Packaging Co. Ltd.,
Ts., Rs. 6,12,638; Saras Poly-
Ltd., 16.5 MTs., Rs. 1,73,441.

E: From Saudi Arabia: Eco-
Ltd., 16.5 MTs., Rs. 1,73,441;
Plast Corpn., 99 MTs.,
7,076; Gupta Plastic Udyog,
s., Rs. 18,463; Hemant Plastics
emicals, 33,000 Kgs.,
,084; Indexim P. Ltd., 33 MTs.,
,084; Jain Irrigation Sys. Ltd.,
s., Rs. 5,16,127; Vinav Plastics
49.5 MTs., Rs. 5,11,930.

PROPYLENE: From Brazil:
lastic Inds., NA., Rs. 2,60,112;
Czechoslovakia: Fibro Plast
34 MTs., Rs. 8,06,100; Mehta
30 MTs., Rs. 2,87,894; From
Plasto Trades, 1,500 Kgs.,
,485; From USA: Narendra
t, 17 MTs., Rs. 2,10,400; From
via: Calcutta Inds. Corpn.,
gs., Rs. 5,93,753.

STYRENE: From Korea:
Plastics Corpn., 34 MTs.,
Rs. 5,15,186.

PVC RESIN: From Argentina: More Water Pipes Ltd., 200 MTs., Rs. 36,62,076; From Brazil: Bhagirath Agro Plast P. Ltd., 50 MTs., Rs. 6,98,100; Hindustan Lubricant, 50 MTs., Rs. 6,98,100; Kisan Plastics, 30 MTs., Rs. 4,18,860; Movilex Plastics Ltd., 50 MTs., Rs. 6,99,731; From FRG: Lucky Plast Pvt. Ltd., 30 MTs., Rs. 6,58,266; From Korea: Jain Brothers Inds., 200 MTs., Rs. 25,52,323; The Supreme Inds. Ltd., 10 MTs., Rs. 13,60,623; From Mexico: Bhor Inds. Ltd., 2 MTs., Rs. 3,924; Crystal Containers, 51 MTs., Rs. 6,92,013; Hindustan Lubricants, 50 MTs., Rs. 6,21,882; From Romania: Ashish Inds., 100 MTs., Rs. 12,93,246; From Taiwan: Lily Chemicals P. Ltd., 52.5 MTs., Rs. 9,87,581.

MATERIALS IMPORTED BOMBAY

(From 16.11.89 to 23.11.89)

ACRYLAMIDE: From Japan: J.M. Chemicals Inds., 7,500 Kgs., Rs. 1,90,734; Kohinoor Water Proof Works, 5,000 Kgs., Rs. 1,27,157; Swan Products, 700 Kgs., Rs. 1,78,020.

ALUMINIUM OXIDE: From USA: Grindwell Norton Ltd., 29,940 Kgs., Rs. 1,96,380; Tony Electronics Ltd., 200 Kgs., Rs. 2,78,048.

AROMATIC CHEMICALS: From Switzerland: Hindustan Lever Ltd., 1,450 Kgs., Rs. 3,53,853.

BROMINE LIQUID: From Israel: Chemical & Allied Products, 6,804 Kgs., Rs. 1,85,724; From Netherlands: Jaysynth Dyechem Ltd., 11,340 Kgs., Rs. 3,17,229.

4 B ACID TECH.: From UK: PDI Chemicals Ltd., 2,935 Kgs., Rs. 16,567.

CALCIUM CITRATE: From Ireland: G. Amphray Labs., 30,400 Kgs., Rs. 3,47,221.

CETYL PALMITATE: From FRG: Proctor & Gamble India Ltd., 200 Kgs., Rs. 11,367.

PARA CHLORO TOLUENE: From Japan: Benzo Chem Inds. P. Ltd., 1,500 Kgs., Rs. 4,42,230; Gujarat Insecticides Ltd., 1,500 Kgs., Rs. 44,223.

2-CYANOPYRAZINE: From Japan: Indo Pharma Pharm., 400 Kgs., Rs. 23,530.

CYCLOHEXANONE: From FRG: Letape India P. Ltd., 1,482 Kgs., Rs. 3,22,943.

DICARBOXYLIC ACID: From France: BASF India Ltd., 1,500 Kgs., Rs. 2,33,967.

DIETHYL CARBOMOYL CHLORIDE: From FRG: Chemipharm Chemical & Pharm., 1,900 Kgs., Rs. 1,53,782.

DIETHYL SULPHATE: From Japan: Ahmedabad Chemicals P. Ltd., 15,640 Kgs., Rs. 3,32,186; Henkel Chemicals India Ltd., 1,840 Kgs., Rs. 46,534.

DIETHYLENE GLYCOL: From Taiwan: Ganalax Trading & Finance P. Ltd., 36 MTs., Rs. 3,71,702.

5-5-DIMETHYL HYDANTOIN: From Japan: Infar India Ltd., 37.7 Kgs., Rs. 39,943.

2,5-DIMETHOXY 4-CHLORO ANILINE: From Japan: IDI Ltd., 5,000 Kgs., Rs. 1,33,179.

2,4-DINITRO 6-SEC-BUTYL PHENOL: From France: Synthetics & Chemicals Ltd., 500 Kgs., Rs. 36,476.

ETHYL FORMATE: From FRG: Cipla Ltd., 1,440 Kgs., Rs. 6,66,000.

FORMIC ACID: From FRG: Pacific Exports, 20,160 Kgs., Rs. 2,86,889.

FURAZOLIDONE BP: From Japan: V. Tribhovandas, 9 Kgs., Rs. 1,25,121.

8 HYDROXY QUINOLINE: From France: Eskay Fine Chemicals, 1,500 Kgs., Rs. 3,15,254.

IODINE CRUDE MIN. 99.5%: From Japan: Lub Chem, 2,000 Kgs., Rs. 6,30,694.

ISOPHORONE: From Japan: Coates of India Ltd., 1,425 Kgs., Rs. 3,06,828.

LINALOOL: From Japan: Hindustan Lever Ltd., 4,760 Kgs., Rs. 5,82,040.

MAGNESIUM OXIDE: From Japan: Geoffrey Manners & Co. Ltd., 300 Kgs., Rs: 1,60,725.

METHYL PARATHION TECH.: From GDR: Devidayal P. Ltd., 31.2 MTs., Rs. 2,57,360.

METHYLENE BIS THIOCYANATE: From UK: Ion Exchange India Ltd., 500 MTs., Rs. 83,833.

MONOETHYLENE GLYCOL: From USA: Reliance Inds. Ltd., 1,498.48 MTs., Rs. 22,40,522.

MONO METHYL ACETO ACETAMIDE MIN. 70%: From FRG: Sudarshan Chemical Inds. Ltd., 15,960 Kgs., Rs. 4,73,529.

MONOSODIUM GLUTAMATE: From Korea: Alpha Trade Agency, 16 MTs., Rs. 3,66,209.

NEO PENTYL GLYCOL: From FRG: Refnol Oil Refineries Pvt. Ltd., 2,000 Kgs., Rs. 48,385.

NITROAMINO PHENOL: From Japan: IDI Ltd., 450 Kgs., Rs. 2,61,674.

PARA OCTYL PHENOL: From Japan: Atsuan Chemical Corpn., 2,000 Kgs., Rs. 49,930.

D(-) ALPHA PHENYL GLYCINE METHYL POTASSIUM DANE SALT: From Netherlands: Cepham Labs P. Ltd., NA., Rs. 3,75,858.

HYDROXY PHENYL GLYCINE METHYL POTASSIUM DANE SALT: From Netherlands: Gujarat Lyka Organics Ltd., NA., Rs. 3,46,667.

PIVALOYL CHLORIDE: From France: Armour Chemicals Pvt. Ltd., 10,080 Kgs., Rs. 6,62,034; From FRG: S & S Pharmaceuticals (I) P. Ltd., NA., Rs. 57,009.

POLYVINYL ALCOHOL: From Japan: G.P. Electronics Ltd., 5 MTs., Rs. 2,33,817; The Raipur Mfg. Ltd., 200 Kgs., Rs. 94,943; Shr Vinyl & Chemical Inds., 500 Rs. 37,393.

POTASSIUM CHLORIDE From Canada: IDI Ltd., 80 M Rs. 2,77,370.

POTASSIUM HYDROXIDE: Fr Czechoslovakia: Arofines, 500 Kg Rs. 65,458.

SODIUM FORMALDEHY SULPHOXYLATE: From Czechos vakia: Sun Export Corpn., 1,200 Kg Rs. 18,135.

TITANIUM DIOXIDE: From FR Plasti Chemi & Inds., 200 Kgs Rs. 9,96,904; From China: K Research Centre, 35 MT Rs. 9,07,894; Popular Chemical C 10.5 MTs., Rs. 2,97,792; From Sing pore: Asian Paints India Ltd., 6,8 Kgs., Rs. 31,12,781.

PARA TOLUIDINE SULPHON ACID: From Korea: PDI Chemica Ltd., 3,000 Kgs., Rs. 1,95,820.

TRIMETHOXY BENZALDE HYDE: From France: Pragati Pharm ceuticals P. Ltd., 2,000 Kg Rs. 7,96,845.

TRIMETHYL PHOSPHATE: Fro USA: Sudarshan Chemical Inds. Ltd 16,574 Kgs., Rs. 6,59,270.

META XYLIDINE ORTHO SUL PHONIC ACID: From Japan: Formo kem India Corpn., 50 Kgs., Rs. 84,99

DRUG MATERIALS IMPORTE BOMBAY

(From 16.11.89 to 23.11.89)

CALCIUM D PANTOTHENATE From Japan: Pharmaceutic Co., 50 Kgs., Rs. 1,14,864.

LACTIC ACID 88% BP/USP: Fro Spain: Grauer & Weil India Ltd., 2,0 Kgs., Rs. 72,003.

PROMETHAZINE HCl BP: Fro China: Western Chemicals, 200 Kg Rs. 98,334.

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n 16.11.89 to 23.11.89)

From Belgium: Muftifilm Pvt. Ltd., 17.15 MTs., 888; From Czechoslovakia: ted Brothers, 125 MTs., 2,340; Fibro Plast Corporation, Ts., Rs. 17,19,042; Kalpesh nds., 100 MTs., Rs. 10,57,872; pan: Kanpur Plastipack Ltd., 50 s. 6,52,396; Narmada Extrusion , 50 MTs., Rs. 7,17,753; Prad- minators Ltd., 3,000 Kgs., ,190; Shankar Packagings Ltd., s., Rs. 12,74,309; From Neth- Moona Plastics Inds., 1,750 2,37,358; From Saudi Arabia: Plastics, 99.66 MTs., 1,161; Indore Plastics Pvt. Ltd., Ts., Rs. 6,23,688; Injecto Plast t. Ltd., 343 MTs., Rs. 41,370; eal Estate, 51.45 MTs., ,302; Shroff Plastics, 17.15 s. 2,09,349; The Supreme Inds. MTs., Rs. 3,30,097; VIP Inds.).10 MTs., Rs. 27,68,065; From re: Bright Packaging Pvt. Ltd., s., Rs. 2,27,304; From USA: ed Plastics Inds., 14.399 MTs., ,578; From Yugoslavia: Abhi- Corporation, 63 MTs., ,251; Ravi International, 72 Rs. 9,56,656; Supra Plast, 50 Rs. 6,37,680.

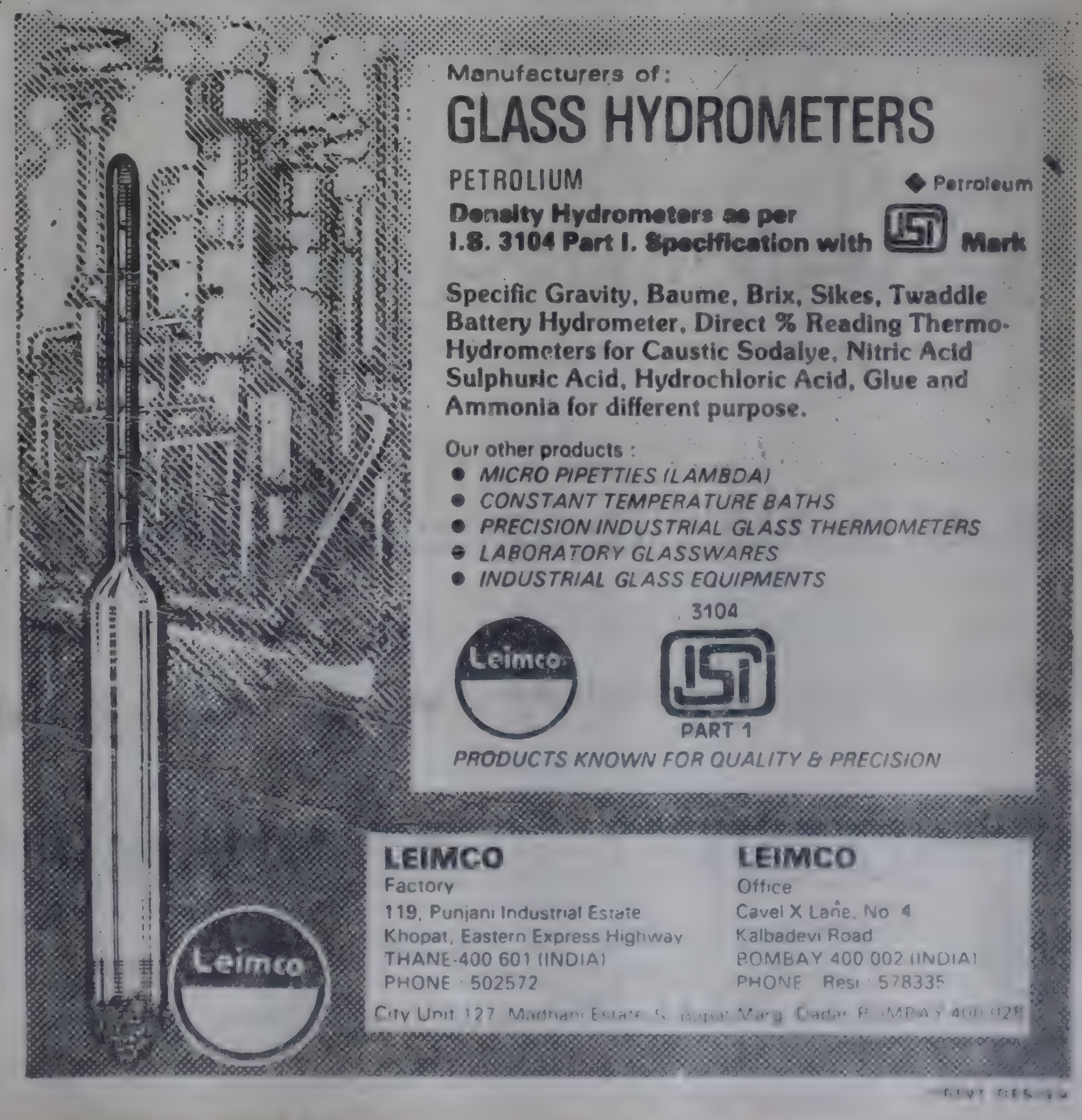
E: From Finland: Sterlite Inds Ltd., 64 MTs., Rs. 1,46,189; atar: Bajaj Plastics Ltd., 99 s. 1,26,888; Grace Plastics, 16.5 s. 2,09,807; Jai Fibres Ltd., 33 Rs. 4,19,615; Raj Packaging Ltd., 31 MTs., Rs. 4,19,616; Filled Fibres Ltd., 16.5 MTs., ,805; Super Pack, 50 MTs., 8,441; From Saudi Arabia: yer, 16.5 MTs., Rs. 17,435; weden: Universal Cables Ltd., Ts., Rs. 6,20,252; From USA: Rollatahers Ltd., 33 MTs., Rs. 4,49,473; Shankar Packaging Ltd., 17 MTs., Rs. 2,14,596.

LLDPE: From Netherlands: K.K. Holdings & Finance Co. Pvt. Ltd., 150 MTs., Rs. 2,08,536; From Saudi Arabia: Fibro Plast Corpn., 82.5 MTs., Rs. 8,39,230; Daniel Phillips & Co. Pvt. Ltd., 97 MTs., Rs. 10,23,858; Gupta Plastic Udyog, 16.5 MTs., Rs. 1,70,643; King Plastics, 31 MTs., Rs. 3,36,194; M.R. Polyfilms Pvt. Ltd., 49.5 MTs., Rs. 51,193; Multifilms Plastics Pvt. Ltd., 1,650 Kgs., Rs. 1,72,231; Pan Asia International Pvt. Ltd., 115.5 MTs., Rs. 11,94,501; Sofeene Plastics, 16.5 MTs., Rs. 1,73,440; VIP Inds. Ltd., 33 MTs., Rs. 3,41,286; Vishal Plastics, 16.5 MTs., Rs. 1,68,098; From UAE: Perfect Colourants & Plastics Pvt. Ltd., 16.5 MTs., Rs. 1,76,365.

POLYPROPYLENE: From Austria: Diamond Polyplast Pvt. Ltd., NA., Rs. 3,89,570; From Belgium: Cosmo Films Ltd., 1,500 Kgs., Rs. 2,92,459; Milton Polyplast (I) Pvt. Ltd., 15 MTs., Rs. 1,78,019; From Brazil: Vishal Plastic Inds., 10 MTs., Rs. 1,30,056; From Czechoslovakia: Associated Brothers, 60.3 MTs., Rs. 5,38,666; Naresh Traders, 84 MTs., Rs. 8,06,100; Progressive Trading Co., 29.8 MTs., Rs. 2,85,974; From Hungary: Sunil Plastics Inds., 28,500 Kgs., Rs. 4,04,586; From Japan: Bisleri Beverages Pvt. Ltd., 2.46 MTs., Rs. 1,62,165; From Singapore: Gujarat Propack Ltd., 3,200 Kgs., Rs. 4,61,152; From USA: Garware Wall Ropes Ltd., 2,640 Kgs., Rs. 31,33,125; From Yugoslavia: Hindustan Ciba Geigy Ltd., 15.5 MTs., Rs. 2,19,799.

POLYSTYRENE: From Austria: Rinins Plast Pvt. Ltd., 1,500 Kgs., Rs. 2,91,465; From Korea: Ellora Electronics, 1,000 Kgs., Rs. 1,52,819; From Korea: Thermopack Inds., 12 MTs., Rs. 3,16,835.

POLYSTYRENE EXPANDABLE: From Korea: Thermopack Inds., 12 MTs., Rs. 2,96,096.



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PVC RESIN: From Argentina: Grover Overseas Pvt. Ltd., 450 MTs., Rs. 54,11,196; Swastik Tubes Pvt. Ltd., NA., Rs. 6,31,542; Vinyl Tubes Pvt. Ltd., 50 MTs., Rs. 6,31,542; From Brazil: More Water Pipes Ltd., 20 MTs., Rs. 28,99,328; From Brazil: Moniles Plastics Ltd., 5 MTs., Rs. 6,99,731; From Korea: Oswal Cable Products, 25 MTs., Rs. 3,45,310; From Mexico: Amrit Chem, 33.3 MTs., Rs. 4,31,600; Chetna Polycoats Private Limited, NA., Rs. 12,71,740; Evermore Pipes Systems Private Limited, 1,665 Kgs., Rs. 2,17,135; Movilex Plastics Limited, 99 MTs., Rs. 13,06,012; Rigidor Plastics Private Limited, 102.434 MTs., Rs. 12,41,653; Shikha Polymers Private Limited, 4,995 Kgs., Rs. 6,37,892; Star Oxides & Chem. Limited, 49.9 MTs., Rs. 6,38,852; From Romania: Seval Ayat Niryat Company Private Limited, 125 MTs., Rs. 16,20,595; From Taiwan: J.K. Rexine Ltd., 105 MTs., Rs. 2,69,358; Kalpak Pipes Private Limited, 170 MTs., Rs. 21,76,062.

STYRENE MONOMER: From Australia: Bayer (India) Ltd., 1,482 Kgs., Rs. 2,33,672.

MATERIALS IMPORTED BOMBAY

(27.11.89)

AMINO ANISIC ACIDANILIDE: From Japan: Sudarshan Chemical Inds., 200 Kgs., Rs. 85,593.

AZO ISOBUTYRONITRILE: From Netherlands: Infar India Ltd., 120 Kgs., Rs. 75,825.

BORAX: From USA: Shiva Impex, 3 MTs., Rs. 20,345.

BUTYL GLYCOL: From USA: Pioneer Chem Tech. Corpn., 29,200 Kgs., Rs. 4,01,476.

PARA TERT. BUTYL PHENOL: From Korea: Resins & Plastics Ltd., 12,000 Kgs., Rs. 2,64,484.

CALCIUM D PANTOTHENATE IP/USP: From FRG: Merck India Lt 1,000 Kgs., Rs. 2,50,074.

CAPROLACTAM: From Belg LML Fibres Ltd., 248.5 Kgs Rs. 75,41,458.

CARBON BLACK: From FRG Varunsak Plastic Paints & Chemicals 420 Kgs., Rs. 2,89,154.

CLOPIRIDOL: From Hungary: Av pharma Inds. Pvt. Ltd., 500 Kgs Rs. 99,182.

CRYOLITE SYNTHETIC: From FRG: Hind Enterprises, 500 Kgs Rs. 29,797.

CUMENE HYDROPEROXIDE From Italy: Polychem Ltd., 5 MTs Rs. 1,61,064.

DICHLORO NAPHTHALENEDIONE: From Japan: Reine Chemicals 500 Kgs., Rs. 82,027.

N,N-DIMETHYL ACETAMIDE From FRG: Ranbaxy Labs., 2,890 Kgs Rs. 67,850.

DIPHENYLAMINE: From FRG Fairdeal Traders, 2,000 Kgs. Rs. 61,034.

EPICHLOROHYDRIN: From Japan: Sun Exports Corpn., 15,84 Kgs., Rs. 4,24,314.

ETHOXY METHYLENE DIETHYL MALONATE: From FRG: Merck India Ltd., 5,000 Kgs. Rs. 10,68,111.

ETHYL CYANOACETATE: From Japan: Jaysynth Dye Chem Ltd., 5,00 Kgs., Rs. 4,39,852.

GAMMA FERRIC OXIDE: From Japan: Straw Products Ltd., 9,000 Kgs Rs. 4,96,026.

1,6-HEXANE DIOL: From FRG IDI Ltd., 1,000 Kgs., NA.

2-ISOPROPYL PHENYL N METHYL CARBONATE: From FRG Bayer India Ltd., 5,000 Kgs Rs. 29,79,585.

ISOPROPYL MYRISTATE: From FRG: Sterling Orgo and Inorgo Chem

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, Rs. 16,26,182.

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hul Chemicals Pvt. Ltd.,
s., Rs. 1,66,981.

PHA PHENYL GLYCINE
E HCl: From Netherlands:
emical Co. Ltd., 2,030 Kgs.,
15; Ranbaxy Labs Ltd.,
s., Rs. 43,00,163.

ARAHYDROXY PHENYL
DANE SALT: From Neth-
mour Chemicals, 2,000 Kgs.,
06.

THYLENE GLYCOL: From
ford India Ltd., 5,060 Kgs.,
15.

VINYL ALCOHOL: From
rden Silk Mills Ltd., 3 MTs.,
29.

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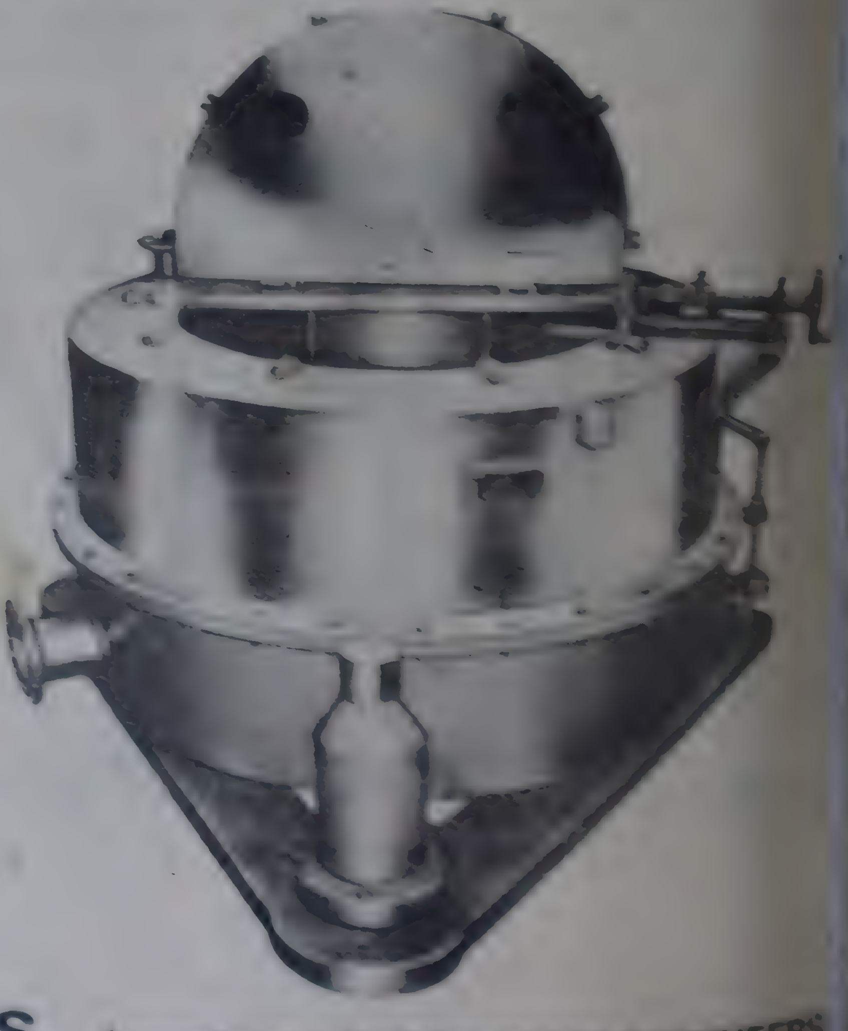

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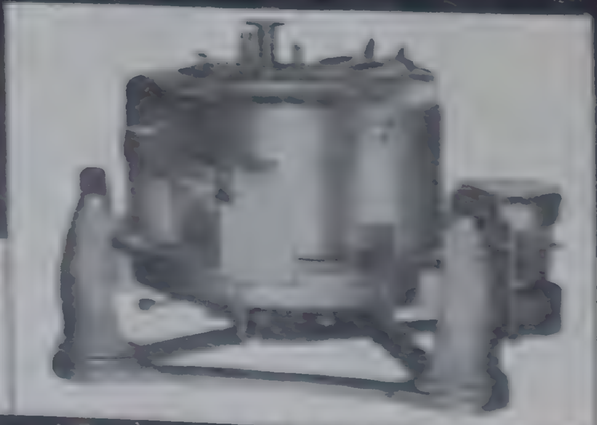

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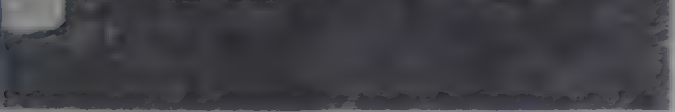

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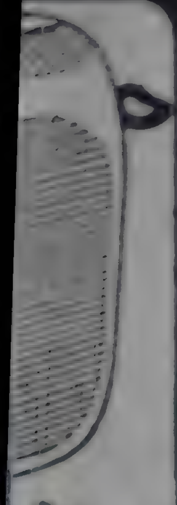
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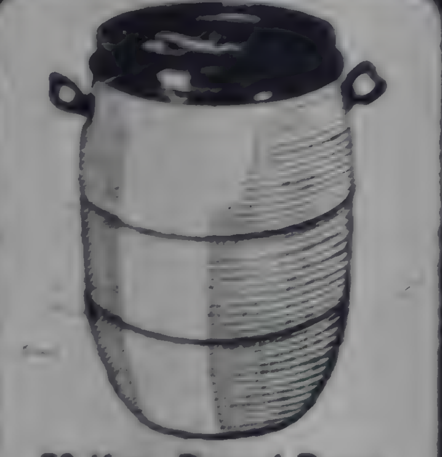
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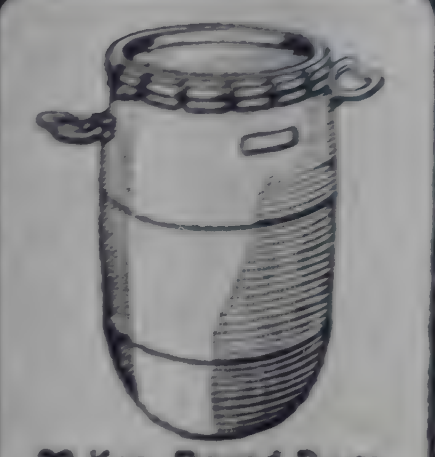
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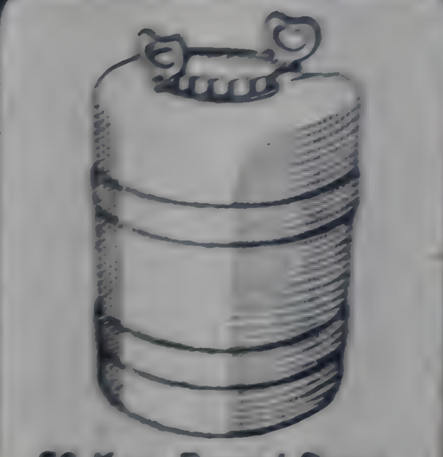
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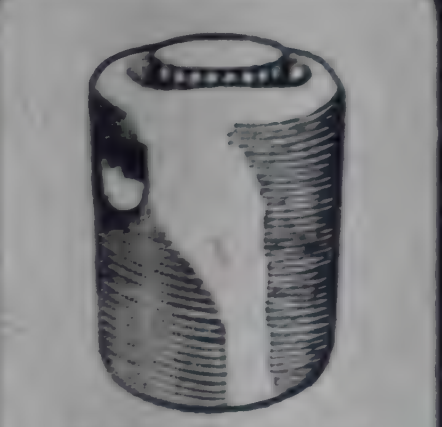
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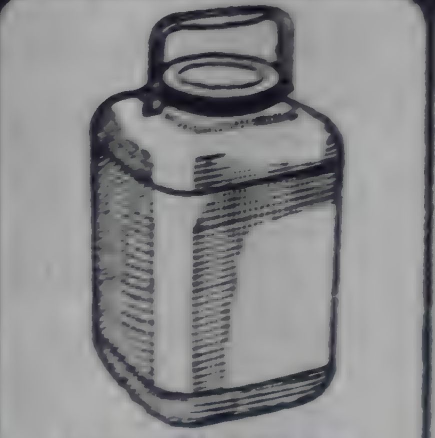
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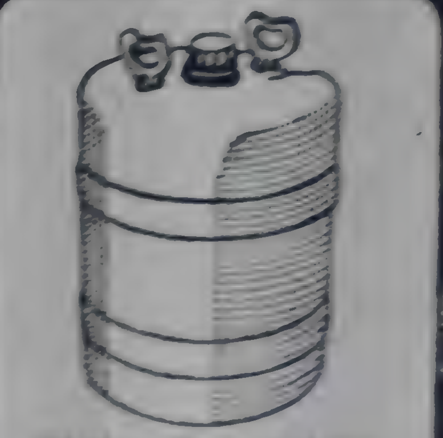
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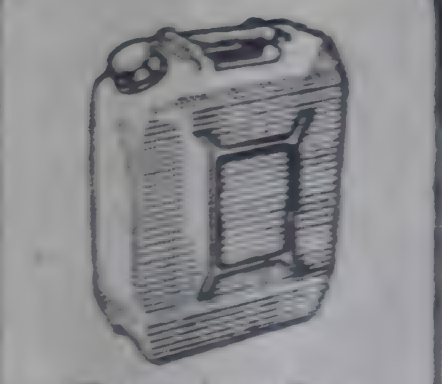
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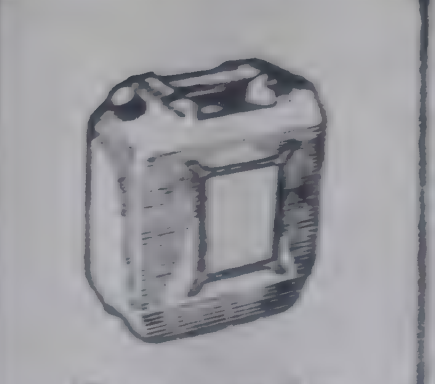
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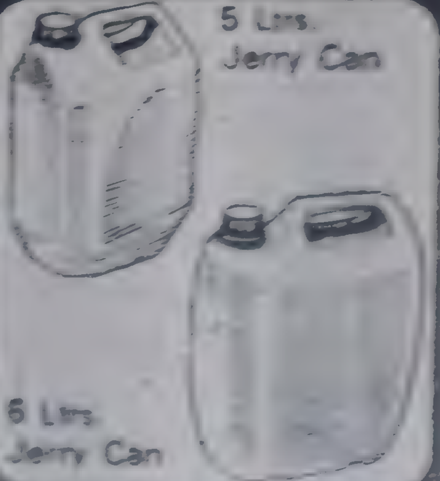
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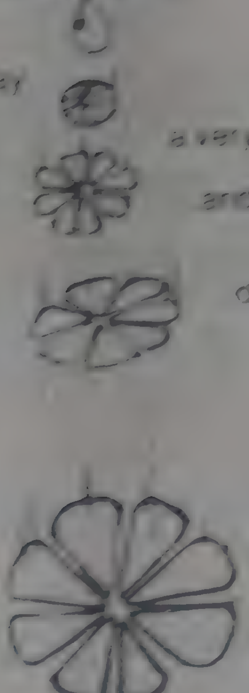

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WEEKLY

VOL. XXXV JANUARY 16, 1990 NO. 19

HERALDING THE 21st CENTURY - 34

Factories in Space

space is imminent, this awesome chal-
demands of human talents and techno-
y tangible rewards to which humanity
[illegible]

building a factory in Space is neither a
d the realms of feasibility. We are begin-
ntary potentials of automation. Already,
ve learned to create machines that sim-
sical actions, and -- in some cases -- even
human beings. Mankind has learned to
y as a novelty, but as a powerful, prac-
he practical uses of automation already
g fictions. But the greatest challenge for
t on the ground but in space -- and spe-
to permanent space stations.

ents: There is little doubt that robotic sys-
ion of any permanent orbiting station. By
ctories in Space" will be required to oper-
f time without the aid of human crew as
conomically feasible to send human tech-
y time repairs or adjustments are needed.
ions now being planned will have to be
greater degree than conventional, earth-

s carried out on board the station will need
ound that, robotic devices will be called
human technicians, both in diagnosing
r d in formulating and executing approp-
addition, automated systems exist in many
ills of human technicians. Space is, after
ment, and many service operations will be
fficult for a human operator in a cumber-
automated tooling and systems needed to
robotic opportunities in space are already

e talk about establishing automated factor-
ant to remember that what we are propos-
[illegible] systems, but many types of
[illegible]. Certainly, there will be automated
[illegible], various types of processing and
[illegible]

vice robots, like ROSA, sensors and monitors, vision systems; computers and microprocessors. And in order for this space-based factory to function effectively, all of these systems will have to be able to communicate with each other, to work together as a unit.

The problem is that different machines generally have very little in common. They are designed for different purposes, and they are controlled by different devices using different operating systems and different control languages. The solution is an executive system that could act as a universal translator, a master utility that could do service as interpreter, moderator and commander-in-chief for all on-board systems and functions. One such control system -- Cell Management Language (CML) -- was recently developed by Westinghouse, in conjunction with the Robotics Institute at Carnegie-Mellon University. CML is a powerful, rule-based software language that uses artificial intelligence and advanced database techniques to manage communication and supervision within a single work cell, or among multiple work cells.

CML has the capability not only to accept input from many systems in a variety of languages, but also to translate communications between systems as needed. That makes operations a lot easier from the machine's point of view and also makes the human side of automation much simpler as well. In addition to being a relatively simple programming language to start with, CML automation programmes can be written using a graphic interface. That means that someone with little or no programming background -- such as a factory or process technician -- can operate the system with no need for specialized training. The automated tooling and systems needed to fully capitalize on future robotic opportunities in space are already available here on Earth. In one application or another, the essential technologies await only our decision to use them, either as they exist or in some appropriately modified form. This is not to say that no further challenges exist, or that the capabilities reviewed here are in any way the final world in automation technology. These systems represent only the first of many generations of robotic systems that will serve to transform the most distant possibilities of today into the practical realities of tomorrow.

Manufacturing Facility in Space: The first Industrial Space Facility (ISF) will be ready for launch by the end of 1990. This privately owned, human-tended, orbiting space facility will provide rental space for manufacturing materials in a microgravity environment. The ISF, being developed by Space Industries, Inc., of Houston, and Westinghouse Electric Corporation is expected to be used first as a materials research laboratory and power source for a docked space shuttle, which will thus be able to remain longer in orbit. But many other uses are anticipated. Business opportunities aboard the facility are expected to include:

- Purification of both pharmaceutical and biological products.
- Growth of large protein crystals to improve the quality and speed of engineering new drugs.
- Growth of large ultra-pure semiconductor crystals for high speed computers and advanced electronic devices.
- Development of new polymers and catalysts.
- Containerless processing of improved fiber optics.
- Creation of metal alloys and other composites that cannot be produced on Earth.

The microgravity environment of the ISF will eliminate heat convection and hydrostatic pressure. It will also eliminate sedimentation and buoyancy, enabling the fusion of mixed particles or immiscible liquids into homogeneous composites impossible to make on earth. The ISF will not be permanently manned, but it is designed to be habitable and will provide a "shirt sleeve" work environment for astronauts when docked with the NASA space shuttle. The ISF is designed to work in tandem with the shuttle and will be in permanent orbit 200 miles above the Earth. NASA has already agreed to deliver two ISF's into space via the space shuttle.

As a major private-sector component of the space programme, the industrial space facility will provide a critical bridge between the resumption of shuttle flights and the launching of the NASA space station. The facility could also serve as a "construction shack" for building up the station and, once the space station is operational, provide it with special purpose buildings and production facilities. Space aboard the ISF is available for lease by private enterprise and governments beginning immediately from Space Industries, Inc. Space-based production of a wide range of materials – semiconductors, alloys, glass and biological preparations – is emerging as one of the most promising fields of cosmonautics. USSR has been conducting several hundred technological experiments involving different materials aboard automatic space probes and manned orbital stations, since 1976. The results are impressive, indeed: weightlessness has made it possible to modify the properties of these materials considerably. Compared to their terrestrial equivalents, the homogenity of the distribution of admixtures in space produced semiconductors increases considerably, while the density structural defect is cut by two to three orders of magnitude. Electrophoresis increases the degree of purification of biological preparations by 6-10 times, and the unit's efficiency by three orders of magnitude. On the other hand, vibration aboard orbital stations has turned out to be a major problem – it spoils the properties of materials considerably. Some, other issues have to be resolved, too.

Space-based production of semi-conductors and biological preparations is a top-priority task. Such materials as gallium arsenide, cadmium sulfide, indium phosphide and germanium are widely used in electronics. However, while one kilogram costs several hundred thousand rubles to produce, space-based production of such materials will entail much greater expenditure. If it were possible now to begin using Photon automatic space probes, which are currently used to conduct technological experiments, the costs would soar considerably. Nevertheless, this is quite acceptable, considering the fact that product quality will improve drastically.

The production of protein-based biological preparations, producer cells, and monodispersion latex diagnostic substances, shows good prospects. While the growth of these protein crystals in terrestrial conditions is hampered by their weight, they can, however be grown in zero gravity. It will also be possible to study their structure with a roentgenograph and eventually use gen production. Interferon, insulin and some icines can also be mass-produced in orbi depends upon the degree of their purific Earth are sky-high – at present, a kilogram ple costs almost a billion roubles to pro production of protein-based preparations

Fodder vitamin producer cells, antibio stances will also be turned out on a mass sca a biologically pure strain of cells in spac earth in the required amount; several gra suffice for this purpose. According to es obtained with the help of space-based tech productivity of industrial fermentory (these tion of B2 fodder vitamins and antibiotics words, the utilisation of more active types valent to a sizeable increase in the capacit the only difference is that one doesn't hav money on their modernisation. Space bio to process waste from the pulp-and-paper leftovers, yielding an annual benefit of se

Manned orbital stations can serve as lab fundamental research into space technolog tained automatic space plants will play the k possess quite a few advantages. First, they level of microaccelerations, which does not (approximately one-millionth of the groun ration). Second, these plants do not require so Third, they are more cost-effective than man automatic space plants are capable of condu cesses on a regular basis, which makes the

The United States, Western Europe and Ja ling these problems. Leading Western Eur that by the 2000 AD, space-based producti the range of 30 to 70 billion dollars annua space vehicles is being developed for this p orbit a self-contained 17.4 ton module with space crews will be visiting the module on a Europeans are currently developing the Eurek vehicles are scheduled to be launched in 1

To sum up, one should say that space-bas feasible and that it can yield huge profits. F of semiconductors and other non-organic ma 3 kg. of biological preparation can be produc it will be necessary to construct specialised the required equipment. Taking into account by Soviet researchers, this task can be accom The expenditure will not exceed the profits. In space-based production in the latter half of

For example, one automatic-mode flight space shuttle costs some 80,000,000 dollars be equipped with a plant for obtaining exper logical preparations or semiconductors, su a tangible technological and economic effec eral times over. Some people assert that ra strial technology will eventually become a production. However, earth based production requires sizeable investments. And some ma tein crystals, monodispersion latexes and larg germanium ingots, cannot be manufactured

(Source: *The Futurist*, June 1987)

MARENA

ESWARAN

Ozone Depletion

over the South Pole is now well known
etween stratospheric chlorine and ozone
hed beyond dispute. The last year's stu-
: out ozone depletion but on a much
Arctic region as well. The much lower
tarctic provides the solid phase for some
ions with chlorine monoxide which trig-
Although the big drop in ozone levels
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loss will reach levels which could trig-
quences to life in the world but chances
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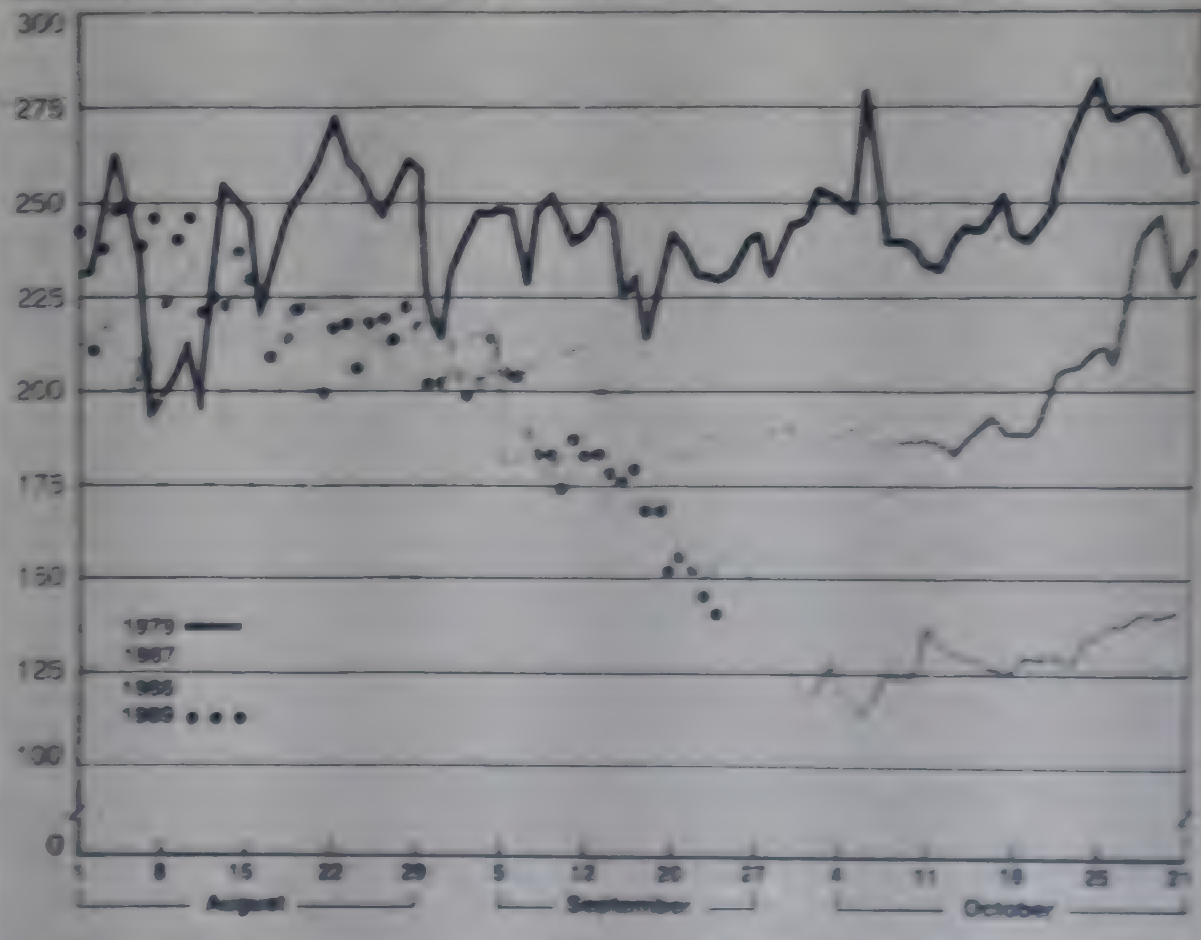
all compounds
that carry significant amounts of halogens need to be curbed. There was no disagreement on the need to eliminate CFC's by 2000 AD. Halons are essential now as fire fighters and the total elimination of CFC's is sure to take decades, when HCFC's may be necessary for an interim period.

At another level is the cost of the present phase out and development of alternatives. There is a proposal for taxing chemicals which contribute to ozone depletion at rates which are proportionate to their "ozone-depleting factor". The tax rates start from $1.37 per lb and go up annual by 45 cents per lb. But this is as a revenue measure and not funded for promoting the substitutes. Even the most ardent supporters of CFC phase out will balk at such a measure which will not apply to production in other countries. But the greater awareness and public preceptions may force the pace of the phaseout.

Antarctic ozone depletion appears to be worsening

Minimum total ozone south of 30° S, Dobson units



New satellite data from the National Aeronautics & Space Administration show that stratospheric ozone above Antarctica is being destroyed at a rapid rate. The pattern of ozone depletion is very similar to 1987, the worst year to date.

Greenhouse Gases

At another level of serious concern is the prospect of global climate changes due to what are called greenhouse gases in the appendage of the atmosphere. An international conference of the Inter Government Panel on Climate Change in Geneva is said to be considering this problem to work ways of devising possible mechanisms for coping with global climate change. "Global climate change could be the dominant foreign policy issue of the next century". There is need to limit emission of the greenhouse gases and the developing countries will have to bear the brunt of this. There are attempts to evolve a consensus paper on the mechanism required and work out a convention or agreement on climate change. The greenhouse gases and their individual share is given in the figure with carbon dioxide being the largest at 49%. The greatest threat is the increasing use of fossil fuels or biomass fuels with China and India in the lead. India cannot certainly forego economic growth and viable alternatives are required for meeting higher energy demands. There is a bill in the U.S. Congress to cut carbon dioxide emissions by 20% by AD 2000. World Resources Institute contends that US is the world's largest contributor of these gases and does not have a policy on CO_2 emissions. There could b
points of view of different countr
an agreement in the next two decad
phase out agreement. There is a w
international equity, technology tra
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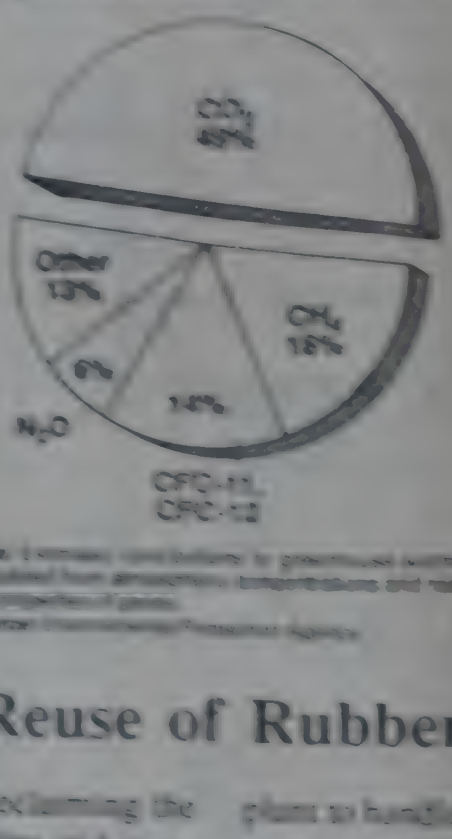

Note: Estimated contributions to greenhouse warming calculated from atmospheric concentrations and radiative properties of gases.
Source: Environmental Protection Agency

Reuse of Rubber

The old and used tyres are processed for reclaiming the rubber in India. This is a physical disintegration and separation from the fibres and is the reclaimed form and the reuse is limited to a small proportion in the rubber matrix for less critical articles. The "reclaimed" rubber is less than 10% of the total rubber demand. This process is not much used in western countries and the mounting waste tyres and other rubber products have been a serious disposal problem. With increasing concern over the environment and the accumulation of wastes the disposal of rubber has assumed concern and newer methods have been developed. The annual number of discarded tyres is over 250 million in USA – 2.5 million tonnes and in EEC it is 1.5 million tonnes and over 1 million tonnes of rubber elsewhere.

In a recent conference on Pyrolysis and Gasification a new process of vacuum pyrolysis has been presented by scientists of the Laval University of Canada. Pilot plant trials are completed and the process recovers the initial compounds which constitute the tyre (Plastics & Rubber Int., August 1990). The tyres are made up of a complex mix of [illegible]

plant to handle 10,000 tpa is expecte
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EXPORT TARGET FOR DYES

Raw materials scenario assessed

In view of the ambitious targets proposed for dye exports from the country, the Dyestuff Manufacturers Association (DMAI) had organised a panel discussion to assess the raw materials availability scenario in the years to come. The meeting, held in Bombay on January 5, 1990, was attended by leading manufacturers/exporters of the dyestuff industry. The panel members included, Mr Sharad Kothari — Managing Director, Jaysynth Dye Chem Ltd., Dr. B.B. Khare — Director (Commercial), Hindustan Organic Chemicals Ltd., Mr. B. Rajagopal — General Manager (Marketing), The Atul Products Ltd., Mr. D. Bhattacharya — Chief Manager (Chemical Business Group), Indian Petrochemicals Corporation Ltd., and Mr. J.M. Mauskar, Executive Director, CHEMEXCIL. The President of DMAI, Mr. Anil Mehta conducted the panel discussion.

Welcoming the gathering Mr. Bakul Patel, former President DMAI, noted that the assessment of raw material availability assumed importance in view of the problems experienced over the past year. With India's position as a major exporter of dyes getting more secure, the need for a realistic assessment of raw material availability became urgent. Mr. Patel noted that the panel with representatives from both the dyestuff industry as also leading suppliers provided an excellent forum for initiating such a discussion.

Growth in real value terms

Stressing the need for growth in terms of both tonnage and value realisation per unit, Mr. Mauskar cautioned that an achievement of say Rs. 2,500 crores would be considerably diluted, if the rupee-foreign currency parity got worse. [illegible] the unhealthy competition between the manufacturers/exporters, Mr. Kothari expressed that [illegible] 20% [illegible] was possible if [illegible] of prices were [illegible]

He mooted the formation of a representative body, such as the Japanese MITI, to enable exporters to get maximum realisation for their exports. Such an association could also help in regular purchases of raw materials and ensure equitable supply to users, felt Mr Kothari.

Increasing competition

The panel members were in agreement to the fact that while India's dyestuff exports sounded impressive in isolation, in reality it represented a little over 5% of the world trade. Given a suitable exim policy and adequate availability of raw materials a target of about 20% of the world trade should be realistic.

With environmental pressures forcing numerous countries to opt for imports of dyes or their intermediates India should seize the opportunity and show improved performance. The recent developments in Eastern Europe with its concomitant "consumerism" should present an excellent opportunity to Indian exporters. Other countries notably China, Korea, Taiwan and Indonesia, were also making rapid progress and could easily end up seizing the moment if Indian exporters failed to do so. "India has gained and lost grounds very quickly", noted Mr Kothari while calling for exporters to sustain the achievements made over the past two years.

Capacity constraints

Mr B. Rajagopal, General Manager Marketing, Atul Products Ltd., emphasised the need for establishing more capacities in dyestuff production. He noted that the current capacity in the country produced about 65,000 tonnes of dyes and intermediates valued at approximately Rs 1,500 crores. To meet an export target of Rs 2,000 crores [illegible]

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with an additional nitric acid plant coming up in a couple of years, HOC will be surplus in nitric acid.

(b) Aniline availability has also improved and further capacity of 9,000 tonnes is expected to be added in about two years.

(c) Acetanilide production is likely to be doubled from 4000 tonnes to 8000 tonnes within the next year.

(d) PNCB shortage is likely to lessen with renewal of supplies of monochloro benzene from Durgapur Chemicals Ltd. To meet the demand for PNCB in the short run, about 125 tonnes of the material has been imported and another 500 tonnes are being planned to be imported.

(e) A 18,000 tonne facility for nitrochloro benzenes costing Rs. 32 crores is also on the cards. The project is currently awaiting government approval.

(f) A proposal to triple capacity of nitrotoluenes in the long run.

(g) A facility to produce acetic anhydride from alcohol.

(h) A new formaldehyde plant of 100 tpd is expected to go on stream in another 12 months.

With the above projects in line, Dr. Khare felt that HOC was geared to meet the demands of the dyestuff industry.

The panel discussion thus ended on a note of cautious optimism while calling for an organised distribution of items in short supply, ensuring fewer plant shut-downs.

SUPERCONDUCTIVITY: SUBJECT FOR ALL SEASONS

Superconductivity has been one area which has emphasised the need for improving the research infrastructure in the country so that the capacity of our scientists to absorb the developments occurring the world over as well as to [illegible]

opening remarks at the inauguration of India's First International Conference on Superconductivity which began at Bangalore on January 10.

Prof. Rao, who is the Chairman of the National Organising Committee of the Conference, said superconductivity has become the subject for all seasons and for people from different disciplines. The challenges that the new field of high temperature superconductivity has posed have been such that the scientists no longer recognise border lines and it, like no other subject, has brought together physical scientists and engineers, he said. At a time when it was being felt that there was nothing left for solid state scientists to do, contributions have been made in the field which have become worthy enough for common people and even politicians to talk about, he added. "The excitement of the last three years has been fantastic", he remarked.

The five-day conference has brought together physicists, chemists, ceramists and engineers numbering over 450 from over 12 countries. Welcoming the delegates earlier Prof. S.K. Joshi, Director of the National Physical Laboratory and Chairman of the Programme Committee for the Conference, said that the participation has been beyond the expectations of the organisers.

Some leading research workers in the field from different parts of the world also made some remarks about superconductivity programmes in their respective countries at the inaugural ceremony which, it must be remarked, was without the customary, but unnecessary, winding speeches of some luminary public figure and the like.

Prof Bianconi, of the Universita la Sapienza, Rome, said that improvement of superconducting materials has been recognised as the key issue today though after 1987 much better crystals have been made and much better experimental results have been [illegible]

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because these latter materials have no chains. It has also been found that clever engineering of oxide materials show that they have more number of copper oxide layers stacked in a unit cell (upto four) result in higher transition temperatures.

Charge transfer

The present understanding, as was outlined by Dr. B. Batlogg of the IBM Research Labs in his inaugural invited talk, is that high temperature superconductivity is probably due to charge transfer in and out of these active copper oxide layers. The mixed valency property of copper is regarded very important in this charge transfer mechanism.

DU PONT PLAN

EI Du Pont de Nemours, one of the world's largest chemical manufacturers, is planning to make the Asia Pacific region a major production base. In the '90s, Du Pont plans to invest about one billion dollars in the area, including several manufacturing joint ventures i India. Right now, Du Pont is seekin permission to set up a Nylon 6,6 plan in collaboration with the Thapars anc Economic Development Corporation o Goa. Simultaneously, it is setting up facilities at Singapore to make adipic acid — a raw material for Nylon 6,6. The strategy is to integrate worldscale intermediate plants with polymer capacities to ensure a strong presence in the polymer markets of Asia. Yet, these projects may make sense to India only if the Government approves the Nylon 6,6 project against which there is tough opposition from the local nylon producers lobby.

CORRIGENDUM

In Chemical Weekly issue dated 9.1.1990, page 102 the name of the advertiser was inadvertantly printed as Intermediate Exim. The correct name should read Intertrade Exim. The error is regretted.

— Editor

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RAISING FERTILISER CAPACITY

Government holding up proposals worth over Rs. 1,720 crores

The Union government is withholding consent to proposals worth over Rs. 1,720 crores for increasing the existing capacity of various fertiliser units in the country. Most of the proposals have been lying with the government for more than a year. In every case, the government's response is that either the proposal is "at an advanced stage of consideration" or is under examination.

The delay in taking a final decision will eventually raise the final cost of raising the production capacity and make the units' operations less viable, industry sources say. Barring one, all the proposals gathering dust in government cupboards are for modernisation, technological upgradation, rehabilitation and replacement of old plants and debottlenecking of units.

Only one proposal is for doubling existing capacity. Yet, the government has taken considerable time in deciding on that. Interestingly, all the proposals have come from fertiliser units belonging either to the public sector or the cooperative sector. Apparently, the sponsorship and administrative support of the fertiliser department to these units have not been of much avail.

In fact, no proposal from the private sector fertiliser industry for raising capacity is pending with the government. According to information available with the fertiliser department, the proposal from Hindustan Fertiliser Corporation (HFC) for revamping their four units — two at Namrup and one each at Durgapur and Barauni — is lying with the government since April 1988.

The revamping cost, estimated at Rs. 466.39 crores, aims to achieve 100 per cent capacity utilisation for these units compared to their existing capacity use level of 38 per cent. The Fertiliser Corporation of India (FCI) has two proposals for modernising its plants at Gorakhpur and Ramagundam. Both the proposals are at an 'advanced stage of consideration' by the government. The one at Gorakhpur is to cost the FCI Rs. 66.65 crores for revamping and upgrading the plant's technology. This will raise the unit's production of urea from the present 182,780 tonnes per annum to 2,15,520 tonnes per annum. The proposal which will also aim at reducing pollution levels and energy consumption, was submitted in January 1986.

The proposal for rehabilitating and installing captive power units at the Ramagundam unit was submitted in September 1988. This would have revised its urea production from the present 1.6 lakh tonnes to 2.97 lakh tonnes per annum. The Cochin-based Fertilisers and Chemicals Travancore Limited (FACT) submitted its proposal in January 1989 for replacing its existing ammonia plant of 340-tonne per day capacity at Udyogamandal with a 900-tonne per day capacity plant, at an estimated cost of Rs. 340.14 crores.

Its proposal for debottlenecking or retrofitting of phosphoric acid plant and NP plant and balancing of sulphuric acid plant capacity at its phosphatic plant at Cochin was submitted in August 1989. The proposal is estimated to cost Rs. 117.65 crores and will raise the production of complex fertiliser from 460,000 tonnes to 585,000 tonnes per annum.

The Indian Farmers Fertilisers Cooperative Limited (IFFCO) submitted its proposal to double the capacity of its Aonla plant in February 1988. Estimated to cost around Rs. 607.4 crores, the proposal is aimed at raising the urea production capacity from 2,200 tonnes per day to 4,400 tonnes per day.

IFFCO's other proposal for revamping its units at Phulpur, Kandla and Kalol to maintain the production level of 19.36 lakh tonnes of fertilisers per annum for another 10-15 years was submitted in September 1986 and is
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Mysore Petro setting up EOU

Mysore Petrochemicals Ltd. is promoting a 100 per cent EOU to manufacture 45,000 tonnes per year of phthalic anhydride in Taloja in Maharashtra costing about Rs. 62 crores.

Had it not been an EOU, the project cost for the same plant would have been about Rs. 130 crores, according to Mr. S.S. Dhanuka, Managing Director of Mysore Petrochemicals, which is promoting the EOU called IG Petrochemicals Ltd. An EOU is entitled not only for duty-free import of raw materials but capital equipment, including those available indigenously, thereby enabling it to cut costs. After five years of production, the EOU has the option of becoming a domestic unit by paying duty on written down value.

Lurgi GmbH of West Germany will be a financial and technical partner, holding about 15 per cent of equity. It has also entered into a 100 per cent buy-back arrangement with IG Petrochemicals. All necessary Government clearances have been obtained by the company. The Indian demand for phthalic anhydride is only about 50,000 tonnes. IG Petro, as per rules, can sell 25 per cent of its produce in the domestic tariff area. The other Indian producers of phthalic anhydride are Tirumalai 30,000 tonnes, Mysore Petro 12,000 tonnes, Herdillia 7,000 tonnes, Indian Dyestuffs and Ambuja Petrochemicals 9,000 tonnes each.

Another attractive spin-off of the project is a 2,400 tonne plant to produce maleic anhydride from the waste water available from IG Petro's phthalic anhydride plant. The technology chosen for the recovery of maleic anhydride is Bayer AG-Lurgi process licensed through Lurgi. The basic engineering and imported equipment are also supplied by Lurgi.

The existing phthalic anhydride plant of Mysore Petro at Raichur in Karnataka is generating some [illegible] tonnes of waste water. This, added to the waste water generated at the EOU in Taloja, will total almost 60,000 tonnes, making the maleic recovery plant a very sound project. Mysore Petro will have a cost advantage of about Rs. 15 a kg. over other manufacturers who produce maleic from benzene, butane etc. which accounts for 68 per cent of the cost. As per rules, there is no duty payable on waste water.

Recovery of maleic will also contribute to considerable savings in phthalic anhydride operations as it eliminates an expensive effluent treatment unit. What is more, the demineralised water will be recycled to the phthalic plant. Being adjacent to IG Petro's plant at Taloja, the maleic project will benefit from cost savings in terms of transport and utilities like excess steam, power and cooling water available with IG Petro at reasonable cost.

Maleic anhydride is used in the manufacture of polyester resins with wide applications from furniture to radar domes, alkyd resins and paints, varnishes, ink and adhesives, petroleum additives, rubber chemicals, photographic chemicals, fungicides and pesticides. It is also a raw material in the production of fumaric acid, succinic acid, aspartic acid and tartaric acid.

The estimated cost of the maleic project, Rs. 12.63 crores, will be financed by a rights issue of 14 per cent partly convertible debentures aggregating Rs. 12.93 crores. This offer to shareholders will be made later this month. The break-even capacity is around 55 per cent of the installed capacity. This diversification is expected to generate an additional turnover of Rs. 6 crores on implementation.

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substitution of benzene with fuel oil in steel plants.

In its report submitted to the government in December 1988, BICP had recommended that the policy of administered pricing on both naphtha and fuel oil may continue but the domestic selling prices of these inputs should be made equivalent to CIF price with 25 per cent import duty to reflect the premium on foreign exchange.

The report had said that as the international prices of crude and aromatics stabilise, the short-term tariff policy should be substituted with the long-term import policy and duties. The prices of aromatics in the long run will structurally align in terms of relative prices of the petro-based products vis-a-vis naphtha price and crude, namely $ 15 and $ 18 per barrel.

For the $ 15 a barrel price alternative, BICP had recommended import duty of 25 per cent for naphtha, 55 per cent for benzene and toluene and 70 per cent for xylenes for actual users. As regards the $ 18 per barrel price alternative, BICP had recommended import duty of 25 per cent for naphtha, 40 per cent for benzene and toluene and 55 per cent for xylenes.

The report had said that the tariff policy in respect of prices of naphtha and fuel oil supplied to steel plants also needs to be considered in the short run since the additional production of aromatics will save substantial foreign exchange.

The production of aromatics at the steel plants was much lower than the potential availability and these were being utilised as energy source by the steel plants. In 1987-88, production of aromatics from all the steel plants was only 16.7 tons.

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Government awaits panel report to fix sale price of paraxylene

The Union Finance Ministry has asked the cost account branch (CAB) under the department of expenditure, to study the actual cost of indigenously produced paraxylene. The Government is likely to fix a fair selling price for it on the basis of the CAB report, which is expected to be submitted shortly. The CAB is understood to be going into details of cost of production of paraxylene by all the three local producers viz., IPCL, Reliance Industries and Bongaigaon Refineries.

The Bureau of Industrial Costs and Prices (BICP) had submitted a report to the government in December 1988 based on the cost of paraxylene in the production of DMT. At that time, IPCL was the lone indigenous producer of paraxylene. Now, the CAB is carrying out a cost study for all the three plants. The authorities appear to be keen on stopping any further imports of paraxylene in view of the adequate availability from indigenous sources on the one hand, and the critical foreign exchange position on the other hand. With a view to curb unnecessary imports and save exchange, the government has already canalised it through IPCL.

Paraxylene is the basic raw material for the production of DMT and PTA. The country has been a net importer of paraxylene all these years and the annual imports ranged between 50,000 to 60,000 tonnes to meet the sole requirement of Bombay Dyeing and partial needs of IPCL and Bongaigaon Refineries, all the three DMT producers.

The situation appears to have improved with the paraxylene plant of Reliance Industries coming into production. The company is understood to have offered 5,000 tonnes of paraxylene per month to the canalising agency after meeting its c

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year's plan. In a bid to cut commissioning time on the basis of the PIB approval, the coal and power project authorities take advance action. This process, too, will be delayed.

In addition to the PIB delay, the Central ministries find that they will have to prepare all over again proposals approved by the previous ministers before sending them to the new cabinet for approval. The process of inviting inter-ministerial comments will have to be started all over again. The projects in the pipeline will have to be redrafted again to reflect the new government's ideology.

DUTY-FREE REPLENISHMENT LICENCE SCHEME URGED

The Federation of Indian Export Organisations (FIEO) has strongly pleaded for reintroduction of the duty-free Replenishment licence scheme on the ground that input-output norms under the advance licensing scheme have expanded to cover more than 500 products.

The duty-free Replenishment licence scheme was withdrawn from April 1, 1998, which adversely affected small-scale exporters. It was first introduced in 1980-81.

The FIEO President, Mr. Rama S. Deora, said in a statement recently that according to this scheme, an exporter had the facility of obtaining duty-free Replenishment licence on the basis of exports already made by him under the advance licensing scheme.

On the other hand, an exporter obtains an advance licence on the basis of an export order with the commitment of fulfilling an export obligation. Mr. Deora said that the duty-free Replenishment scheme had a number of advantages.

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Caprolactam shortage

Once again the nylon spinners are facing a severe shortage of caprolactam, their basic raw material. In the past two years, there have been several occasions when the industry had to cut down the production of nylon yarn owing to caprolactam shortage. Consequently, the art silk weavers in Surat and other places had to live with shortages and high prices of nylon yarn. It is indeed unfortunate that at a time when there is a growing domestic and export demand for nylon yarn, the spinners are forced to cut down their production for want of caprolactam. This shows the lack of proper planning on the part of the concerned authorities.

The prestigious multi-crore ammonium sulphate caprolactam plant of the public sector Fertilisers and Chemicals Travancore (FACT) to produce 50,000 tonnes of material per annum was to have been commissioned in September last year. Consequently, the government which is facing a foreign exchange crunch, has been permitting caprolactam imports only in small lots. Thus the total imports allowed so far have amounted to only about 60 per cent of the actual imports last year with no indication about the allocation of further foreign exchange. The sole producer of caprolactam in the country, the Gujarat State Fertiliser Corporation (GSFC) has been able to supply hardly 20 per cent of the total requirement of the material estimated at 75,000 tonnes.

Now the manufacturers of nylon filament yarn are once again considering production cuts till the supply position of caprolactam improves. The nylon weavers have expressed their fear that if there is a production cut by spinners, the already prevailing unofficial premia on different deniers of nylon yarn will shoot up further as shortages aggravate. Since the caprolactam plant of FACT has still not gone on stream, there is an imperative need to arrange for immediate import of the material.

CUSTOMS DUTY FOR PLASTICS REVISED

The rates of customs duty for major plastic raw materials have been revised with effect from January 5, 1990. According to an official release on January 8, the customs duty on polypropylene and copolymers has been revised from 20 per cent ad valorem to Rs. 7000 per tonne. On high density polyethylene moulding powder and granules, the duty has been revised from 20 per cent to Rs. 6,400 per tonne. On low density polyethylene and copolymers of low density polyethylene other than LDPE based sheathing compound and insulating compound, the duty will now be Rs. 6,200 per tonne against Rs. 2,000 per tonne earlier. (
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OPEC crude "is evidently outpa
forecasts due to higher-than-ex
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OPEC supply", MEES said.

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Policy on aromatics

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shortages that may arise from time to time, aromatics will have to be imported.

It is important to think of a rational import policy and a duty structure that would not only protect domestic industry but also ensure that domestic users of aromatics are not put in a difficult position compared with those abroad. In this context, BICP's recommendations for reducing the duties on imported aromatics are welcome.

It is also necessary to remove some of the aromatics from the canalised list. But they need not be put on the OGL list for all and sundry to import as suggested by BICP. That would give scope for speculation, especially in the light of the unsteady conditions prevailing in the international market. An actual user clause in OGL is necessary and will help ensure that domestic producers pass on the benefits of lower duties to the downstream units.

METALS GLUT

Prices of base metals are expected to slide down in 1990 from the levels they had generally maintained last year. The current forecast is that production will rise and demand decline to a considerable extent in the current year. The average price of copper which was 125 US cents a pound in 1989, is anticipated to come down to 95 US cents in 1990 (24 per cent fall). Aluminium is forecast to lose 16.1 cents at 71.5 cents, tin to shed 124 cents at 384 cents, zinc down by 18.4 cents at 57 cents, lead to lose three cents at 27.2 cents and nickel nearly 150 to 200 cents at 350/400 cents. The expected price fall in copper in 1990 is attributed to the build up of surplus of 200,000 tonnes of refined copper which may exceed global demand.

It is estimated that with better utilisation of enlarged capacity the mine output would be up by 4.2 per cent and refined production by 3.3 per cent.

On the other hand copper consumption growth rate is forecast to decline in 1990. Similarly the growth in the consumption of aluminium is expected to be sluggish, particularly in industrialised countries, since the key sector in need of the metals, such as automotive and construction are facing a downturn in their operations.

A global market study on metals says that aluminium prices will continue to fall unless the excess supplies are reduced considerably. Consumption may be around 615,000 tonnes in 1990 against 650,000 tonnes last year.

SREE KRISHNA PHARMA

Sree Krishna Pharmaceuticals (P) Ltd., the only SSI unit manufacturing folic acid in the country, has decided to embark upon a diversification programme, at a cost of over Rs. 1 crore, into formulations.

Addressing newsmen in Hyderabad recently, Dr. V.V. Subba Reddy, Chairman of the company, and Mr. P.B. Sattur, Director, stated the company is one of the pioneers engaged in the manufacture of bulk drugs since 1975 and over the years had grown to touch an annual production of 700 tonnes of paracetamol, used by a number of top companies in the country.

After achieving success in marketing paracetamol and folic acid with annual turnovers running into Rs. 4 crores and Rs. 2 crores respectively for each of the products, the diversification is now being launched.

It is proposed to manufacture analgesics, antiinflammatory, heamatinics, paediatric, antidiabetic and cardiovascular ranges, Dr. Reddy said. A few trial enquiries on export of folic acid are under consideration and hopefully export market will open up for folic acid very soon, Dr. Reddy observed.

Chemistry Day

For the second year in succession the Rotary Club of Ambernath jointly with Marathi Vigyan Parishad, observed "Chemistry Day" on December 2, 1989 at Rotary Bhavan.

About five hundred SSC students and teachers from P.M.M. Innerwheel School, Kansai School and Mahatma Gandhi School attended the programme.

Rtn. Dr. V.M. Vaidya who conducted the programme, explained to the audience that we observe Chemistry Day so that people get rid of their misgivings about chemistry and good students are attracted towards chemistry. The faculty came from an Education Institute, a Consulting firm, R & D Centre and a Production Unit.

The first speaker was Shri S. Jawadekar, who is a noted Sci-Fi, writer in Marathi, spoke on the subject of history of chemistry. He made his talk very amusing by telling very interesting stories and facts. He mentioned that some people had taken patents on making "Sherbats" by using hydrochloric acid.

Prof. Rajadhyax from Department of Chemical Technology spoke on catalysis. He made the subject very lively. He explained at length the catalytic synthesis of Ammonia.

He said that there are challenges in chemistry, like nobody has improved on the ammonia synthesis since 1913 and if bright students take to chemistry only they can accept such challenges.

Dr. S.G. Kane, who is Research & Development Manager in NOCIL, Thane, explained how one has to think about the 'Arithmetic' of requirement, (demand), planning and production. He spoke on Petrochemicals. He pointed out how many leather
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Plastics are vital

No official explanation has been given for the sharp rise in import duties on polymers. The intention cannot be to protect domestic producers, who are already making handsome profits. One disturbing possibility is that the new Government wants to lower the priority given so far to plastics. It may be premature to reach such a conclusion, but some noises emerging from Yojana Bhavan suggest that this may indeed represent official thinking. Petrochemical complexes are highly capital-intensive and thought to be inappropriate in a strategy aimed at maximising employment. And since foreign exchange is scarce, we cannot rely on increasing imports of polymers either. So it is just possible that the new Government will be happy with a situation where the demand for plastics is curbed, in part by high prices.

We hope this will not happen. Far from being unsuitable for a strategy that emphasises rural development and employment, plastics are vital and should be seen as such. A petrochemical complex does not provide many jobs. But downstream processors are mainly in the small-scale sector and generate a huge number of jobs. Rural consumers want cheap plastic goods like PVC footwear, buckets, ropes and other household goods. Farmers need plastic pipes as well as drip-irrigation systems and plastic sheeting for mulching and for constructing greenhouses. Conserving water is of the highest importance in agriculture today, and plastics hold the key to such conservation. Drip irrigation slashes the water requirements of a variety of crops. Sheet mulching prevents evaporation, and has become the standard technology for vegetables and other produce in most countries. Plastic greenhouses are essential for the temperature control required for high-quality flowers and vegetables for export, and they also increase agricultural productivity in colder regions. Plastic covers have [illegible] thus saving enormous areas of forests from denudation. This is not the only environmentally excellent feature they have. Mulching improves soil quality and cuts erosion. Drip irrigation conserves fertilisers and hence the deleterious run-off of nitrates.

If plastic prices are raised by duties, they will no longer substitute wood and metals to the extent they have the world over. Such substitution is highly desirable. Plastics are less capital-intensive and energy-intensive than metals, apart from being much cheaper. To the extent they substitute wood they conserve our forests. Raising plastic prices will tend to increase the use of metals and wood. Metals are imported at the margin, and it makes more sense to import polymers than metals.

Finally, petrochemical crackers will convert high gas fractions (ethane, propane, butane) that we produce into valuable raw materials. If this is not done, these higher gas fractions will simply be burned as fuel in boilers and power plants, and that represents a terrible waste of scarce resources which can substitute imports. No doubt crackers are capital-intensive but they are not a waste of resource since they utilise gas fractions which would otherwise be burned. Thus they conserve both resources and foreign exchange. This means there is a strong case for reducing the duty on polymers and encouraging their use. The Government, regrettably, seems to be moving in the opposite direction.

– **Financial Express**

SEMINAR FOCUS ON US TECH TRANSFER

Indian exporters would have to upgrade their technology in high tech areas to make a dent in the US market. [illegible] was the view expressed by the speakers at a one-day seminar on "Doing business with the US" jointly [illegible] by Indian Bank, the US Department
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The NAPCO project is to come up at Manali, adjacent to MRL refinery. The intermediates produced by the company from naphtha to be supplied by MRL are benzene, xylene and purified terephthalic acid (PTA), used in synthetic textiles, pharmaceuticals, paints, pigments, pesticides, dyestuffs, polyester films, synthetic detergents and rubber chemicals.

Tamil Nadu Petroproducts Ltd. (TPL) promoted by SPIC and the Tamil Nadu Industrial Development Corporation (TIDCO) has incorporated the process of UOP which has enhanced the quality of linear alkyl benzene (LAB), the detergent raw material.

Despite a disadvantage in the cost of N-paraffin, the feedstock, the company has enjoyed a reputation for superior quality ever since it began production.

The company is now reviewing the product-profile of Spic Fine Chemicals, which is to produce phosphate-free detergents for the first time in the country in collaboration with Henkel, the West German chemical giant.

The company proposes to produce a range of products using Henkel know-how in addition to fabric detergents as proposed earlier. Henkel will have equity participation in the new venture.

SPIC also proposes to set up a unit to manufacture Penicillin-G at Cuddalore, Tamil Nadu, with a capacity of 1000 mtpa. Revised cost estimates of the project, originally estimated to cost Rs. 45 crores, are being submitted to financial institutions shortly.

SPIC has tied up with a Portuguese company for Pen-G technology, as wellknown firms with Pen-G technology have refused to part with their knowhow.

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Manali Petrochem to enter capital market

Manali Petrochemicals is entering the capital market with a public issue of 160 lakh equity shares of Rs. 10 each at par on January 22. The issue has been made to part-finance its Rs. 101.70 crore hi-tech project for the manufacture of propylene oxide/propylene glycol (PO/PG) and polyols which are 100 per cent import substitute products.

The company has been promoted by Southern Petrochemical Industries Corporation Ltd. (SPIC). The cost of the project is being met by an equity capital of Rs. 32.40 crores, rupee term loan of Rs. 58.71 crores, and foreign currency loan of Rs. 2.29 crores from financial institutions and an unsecured loan of Rs. 8.30 crores from the promoters.

Announcing the public issue in Bombay recently, its Managing Director, Mr. G. Raghavendran, said that located at Manali near Madras, the company's most modern plant would have an annual capacity to produce 12,000 tpa of propylene oxide for captive consumption for the manufacture of 6,250 tpa of propylene glycol and 6,000 tpa of polyols per annum. The plant is scheduled to be commissioned by April, 1990. The project enjoys an unique advantage of obtaining its basic raw materials – propylene and chlorine from MRL and SPIC (heavy chemical division) respectively.

Propylene glycol would be used in a wide range of industries such as pharmaceuticals, food flavour, syrup, cigarettes and polyols in furniture, footwear, refrigeration, industrial insulation, automotive parts, etc. The country's entire requirements are currently being met by imports. With the availability from the indigenous source the demand for these products is likely to increase rapidly.

Being a 100 per cent import substitute product and with steady growth in demands it would not pose any marketing problem. The project hopes to break even at 42 per cent capacity utilisation. According to the projections, the company is likely to achieve a turnover of Rs. 60 crores during the first year, Rs. 70 crores in the second year and Rs. 80 crores in third year and hopes to earn a gross profit of Rs. 20 crores, Rs. 23 crores and Rs. 26 crores respectively. The company is likely to break-even in the first year and expects to earn a net profit of Rs. 3 crores in the second year and Rs. 6 crores in the third year of operations, he added.

DUTY ON TEXTILE HAND-PROCESSING UNITS HURTS MANY

A large number of textile hand processing units have imposition of ex thousands working units out of job.

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News in Brief

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Mr. Repnik said there was a firm political will to provide development co-operation to India this year in the same magnitude as that given by Germany in 1989, roughly about 800 million marks.

Mr. Repnik heads an economic delegation that will hold talks with the Indian Government for exploring new areas of co-operation.

CALL TO MEET DEMAND FOR COMPUTER CHIPS

Prof. C.N.R. Rao, Director of the Indian Institute of Science (IISc), recently called for the establishment of more foundries to meet the large demand for computer chips within the country and abroad.

Inaugurating the two-day third international workshop on Very Large Scale Integration (VLSI) design in Bangalore, he said the country required at least two such foundries immediately. The industry in this area should strive to develop the competence to become export-oriented.

He said a country like India had very few options and had to decide its priorities judiciously to build up a strong technology base.

The Bharat Electronics Chairman and Managing Director, Captain S. Prabhala, in his address, said the country should not wait for the setting up of the infrastructural facilities but should go ahead and develop the various tools and capabilities needed for VLSI design and testing.

FACILITIES FOR HANDLING BASIC PETROCHEM MATERIALS

The facilities for handling basic materials like naphtha for the proposed Haldia petrochemical complex are being set up alongwith the second oil jetty which is being constructed at the Haldia dock complex of the Calcutta Port Trust, according to CPT sources.

The sources said that there is a proposal to draw a pipeline from the second oil jetty and carry the naphtha in a cradle like structure.

They said that the naphtha would have to be carried over a distance of around six kilometres between the Haldia dock complex and the Haldia petrochemical's proposed location. CPT sources said that the Rs. 35-crore second oil jetty was being constructed by Korean contractors.

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CLE proposes Rs. 400 crore modernisation fund

The Council for Leather Exports (CLE) has submitted to the Centre a proposal for the creation of a Rs. 400 crore fund for modernisation of the leather industry in the Eighth Plan.

The council has also approached the Reserve Bank for forming a task force to look into the question of easing the lending norms for the industry.

The proposal for the modernisation fund is presently under the scutiny of the Ministries of Commerce and Industry and the Planning Commission. Details of the scheme will be worked out once the proposal is accepted in principle.

The fund, conceived on the lines of the one existing for the engineering industry, is sought to be financed by Plan allocations. In this context, it may be noted that the industry, at a discussion on the subject in Madras recently, had set its face firmly against the imposition of any cess on it for purpose of floating the fund.

The figure of Rs. 400 crores is based on the rough estimates made by the council on the modernisation requirements of the industry in the Eighth Plan to help it achieve the production and export targets. The council has also suggested that the scheme could be put on stream in the form of a revolving fund of, say, Rs. 20 crores.

The case for the speedy modernisation of the industry is supported by a host of reasons, the limited domestic raw material availability being an important one. As the production of hides and skins does not pick up in tune with the increase in demand, the prices, for one, have been going up at an alarming rate. Efficient and cost-effective use of the available resources is the only way to measure up to the situation, it is felt. Also the growing competition in the international market with the entry of new exporting countries on the scene calls for stringent quality standards to be maintained by Indian products in order to get a toehold in the market. Competitive pricing is another major factor. The answer to all these pressing questions lies in quick modernisation of the industry, it is argued.

Regarding lending norms, the council feels that the present norms have become outdated in the wake of the sweeping changes the industry has undergone in recent years. Besides, to achieve the ambitious plans set for the years ahead, the industry would need substantial financial backing, which will be hard to come by under the present lending norms.

The task force, proposed to be constituted of representatives of the industry and the financial institutions, will go into the lending structure for the industry and make suitable recommendations to the Reserve Bank for necessary changes and relaxations.

LEATHER GOODS EXPORTS MAY CROSS Rs. 2200 CRORE

The upswing in the export of leather and leather products recorded in recent years continues to retain the tempo with another target-shattering performance on the cards this year.

Indications are that exports will top Rs. 2200 crores against the target of Rs. 1800 crores set for the year. More importantly, this will render meaningless the Rs. 2000 crore target envisaged for the ensuing year (1990-91). According to Mr. M.M. Hashim, Chairman, Council for Leather Exports (CLE), the projected export turnover will be nearly 35 per cent more than the Rs. 1600 crore achieved in the previous year. Till October end, exports have touched Rs. 1000 crores.

Addressing a function to the inauguration of the Centre for and Product Development in recently, he said another significa ture of the export performance current year is that all the items leather products sector have reg increased returns, bringing dow share of finished and semi-fin leather to around 40 per cent from 50 per cent last year. In garments ticular, the increase is expected nearly 100 per cent -- from Rs crores to over Rs. 300 crores. Th also be much higher than the targ Rs. 250 crores.

Mr. Hashim noted that the one handicap of the industry vis-a-vis target is the shortage of trained power. By 1994-95, the requireme this regard is anticipated to be It is in this context that the counci taken the initiative to start the tra centre. He pointed out that this is a beginning and the council had up plans to start an exclusive tra institute to be managed entirely by industry and financed by it and mercial banks. The outlay has estimated to be Rs. 50 lakhs and Indian Bank has come forward to up 50 per cent of the cost.

He also disclosed that the State ernment has been approached to cate suitable land for the purpose expressed the hope that this will through shortly. Mr. A. Sahasran Executive Director, CLE, explained background to the opening of the To cope with the quantum jump in activities of the industry, it is im tive that enough trained manpow available to it at any time. Apar starting new training institutes council has also taken up with the ernment the need for revampin improving the efficiency of the ones. Mr. M. Gopalakrishnan, man and Managing Director, Bank, inaugurated the centre. Mr Duraivelan, Regional Chairman proposed vote of thanks.

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l that the plant will have three gas turbines and a steam turbine with production capacities of 30 MW and 45 MW respectively. The debt equity ratio for the project will be 1:4 with the equity amounting to Rs. 40 crores. GACL was likely to get about 25 MW of power, while power supply to the rest will be in proportion to their requirement. With the full commissioning of this plant, GSFC will be practically independent of the State Electricity Board for its power requirement. Gujarat Nylons Ltd., a company promoted by GSFC, with a production capacity of 6,000 tonnes of nylon filament yarn has commenced partial production. The unit which presently manufactures nylon chips, will also manufacture yarn. The total cost of the plant is Rs. 120 crores.

Mr. Swaminathan said that GSFC has also decided to establish a desalination plant at Sika at a cost of Rs. 2 crores. About 80,000 litres per day of sewage water would be treated at this plant for recycling. On the fertiliser front, GSFC which is a pioneer in the field of bio-fertilisers, has already started commercial production of bio-fertilisers and the sales are expected to be around Rs. 40 to Rs. 50 lakhs in the current year.

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	PT-12/89	Used Jute bags unspoiled/spoiled and having cuts of various sizes and shapes including unspoiled/spoiled jute length of various shapes and sizes. (4 MT per month approx.)	--	10,000/-
.	PT-13/89	a) Propylene Glycol (Imp.) (Lot basis) b) Pot. Ferrocyanide (Imp.) (Lot basis)	4.730 MT 0.065 MT	2% of the quoted value

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Fertiliser output dips

The performance of the fertiliser industry during April-October, 1989 has been far from satisfactory. According to official data, there has been a drastic decline of 38.3 per cent in the production of phosphatic fertilisers during the period.

Though the rains were bountiful, after a drought of three years, fertiliser production was affected by various constraints such as power shortage, short supply of natural gas, shortage of imported phosphoric acid and obsolete equipment.

A good monsoon implied a greater demand for fertilisers. The Ministerial pronouncements convinced that targets set for the year would be met and only a small quantity would have to be imported to bridge the demand-supply gap. With the commissioning of the fertiliser units along the Hazira-Bijaipur-Jagdishpur pipeline, a comfortable state of affairs was expected.

However, the official data shows little cause for cheer. There has been a decline in the production of nitrogenous fertilisers since August 1989. Production in August fell from 5.67 lakh tonnes in 1988 to 5.65 lakh tonnes in 1989, a decrease of 0.3 per cent, in September from 5.21 lakh tonnes in 1988 to 5.07 lakh tonnes in 1989 and in October from 5.97 lakh tonnes in 1988 to 6.61 lakh tonnes in 1989, a decrease of 6.1 per cent.

However, the fall in production of phosphoric fertilisers has been more pronounced. In April-October, 1989 the production was at 8.57 lakh tonnes against 13.80 lakh tonnes in the corresponding period of 1988 showing an overall decline of 38.3 per cent.

Prodcution in April 1989 of phosphatic fertilisers fell considerably, from 1.73 lakh tonnes in 1988 to 0. tonnes in April 1989. This sh decline of 53.1 per cent. Simil production fell in the successive as against the same periods in vious year. In May production d by 49.2 per cent over the previo in June by 46.5 per cent, in July per cent, in August by 33.5 per c in September by 32.9 per cent.

It is interesting to note that ph tic fertiliser production fell shor target of 2.10 million tonnes by a as 20.7 per cent during 1988-8 had been mainly because of the age of imported phosphoric aci

The fertiliser industry has been various Government created prol The previous government had ch the retention pricing scheme, lin depreciation and capacity utilis The result was that old units cou achieve capacity utilisation nor for the industry due to obsolete ma ery and also could not force a r production as that would only add prevailing glut caused by the drought.

The industry has not yet reco from the impact of the drought.

NFL VIJAIPUR PLANT POS RECORD OUTPUT

The Vijaipur plant of the p sector National Fertilisers Ltd. (N near Guna, (M.P.), created a new duction record of 5.96 lakh tonn urea utilising 106.6 per cent of its e lished capacity in the first nine mo of 1989-90.

An official release in Guna, said plant helped increase the cou foodgrain production by six mi tonnes by producing more than 1. tonnes of urea during the last two of its going critical. It also prod more than 3.47 lakh tonnes of amm utilising 103.9% of its established ca city between April and December

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AK FERTILISER MNC's MONOPOLY

Key role for PDIL, FEDO

Government has initiated ak the long monopoly of iants like Snam Progetti Danish associate, Haldor ecution of fertiliser pro- ountry.

vith, the government has decision to promote and indigenous fertiliser con- s in a big way. The objec- w these units to grow and fficiently strong financial on the foreign giants while ith them for bagging fer- ts.

us has also emerged within ent to give adequate sup- digenous fertiliser consul- nd ensure that they are not d against in awarding con-

vel meting, held in New tly, discussed this issue The meeting was attended icials of the Department of Finance Ministry and the mmission.

the main issue on the to discuss the annual plan ser department, the discus- round to the scope of ope- f domestic fertiliser units like the Projects and t India Limited (PDIL) and and Engineering Design (FEDO), a divisior of the d Fertilisers and Chemicals Limited (FACT).

getti and Haldor Topsoe are mplementation of almost all projects set up in the coun- t decade. They have bagged ammonia-urea projects that up in the last nine years. the domestic consultancy von the contract, the Italian giant has placed a more dominant role in the execution of the project.

With a view to breaking this stranglehold, the government has decided that in the annual plan for the next year, special financial allocations would be made for PDIL and FEDO.

Special financial support for the two organisations in the next year's plan will only be the first step in ensuring that they strengthen their infrastructure and expertise in this area.

Other steps in this directioin will include encouragement to the two units to expand their operations and accord some weightage in their favour while selecting prime contractors for fertiliser projects.

Even where PDIL and FEDO are collaborating with Snam Progetti or Haldor Topsoe, the government effort would now be to ensure that the Indian firms get a larger share of the business generated from the projects under implementation. At present, the foreign giants corner a major chunk of the business mainly through import of capital equipment and components.

It was pointed out that PDIL and FEDO have done well in terms of timely execution of the few fertiliser projects they undertook in the past. Even the functioning of the plants set up by them (for instance the Hazira plant of IFFCO by FEDO) is satisfactory going by the high capacity utilisation achieved by them.

The fertiliser department is understood have also claimed that PDIL and FEDO have acquired the expertise in all unpatented process know-how available for setting up fertiliser projects. Hence, they should be allowed to play a larger role in execution of fertiliser projects in preference to the foreign giants. The government move to break the monopoly of Snam Progetti and Haldor Topsoe is also in response to a plea from the domestic fertiliser industry that they be freed from the stranglehold of these foreign giants. Fertiliser industry leaders are reported to have approached the Government in this connection, soon after it took over in December 1989.

The industry also wanted the new government to withdraw the Congress-I regime's restrictions imposed on it to import fertiliser equipment and technology only from Snam Progetti. It pleaded that there should be freedom for buying the best equipment and technology from anywhere in the world.

As a result of these restrictions, the foreign giants had monopolised the Indian fertiliser industry and the main casualty were PDIL and FEDO, which had the necessary expertise in this field, but were denied any opportunity to prove their mettle. The Government appears to have resolved to remedy this situation.

5-22 PER CENT CCS FOR 25 ITEMS

The Union Government announced recently the cash compensatory support scheme (CCS), ranging from five to 22 per cent, for 25 exportable items. The CCS effective from January 5 will be applicable till March 31, 1992.

CCS is given to selected export items to compensate for certain disadvantages like unrefunded indirect taxes, freight disadvantages and product/market development cost.

The items covered under CCS include sodium sulphate, methyl acrylate and plastic electrical accessories.

CCS would be effected in pursuance of offers/contracts received and finalised on or after January 5 and would be in force for little over two years till March 31, 1992.

Science research must help develop rural aras

Priorities in science research should go to sectors that will help generate income and employment in rural areas. Land and water-based occupations will have to be the mainstay of the right to work principle but they are crying for added attention. This was stated by Dr. M.S. Swaminathan, while addressing the 59th Annual Session of the National Academy of Sciences in Hyderabad on January 6, 1990.

Even where there is scientific knowhow, its conversion into economically viable and ecologically sustainable technology has often been neglected and unless these problems are attended to, the country will continue to stagnate in a situation where the human resource is under-valued and physical assets are over-valued.

Dr. Swaminathan said the task of making the right to work a meaningful and not a cosmetic one is extremely difficult considering the demographic profile of our population. There is also a mismatch between the systems approach needed to achieve results and the uni-dimensional administrative structures operating in the field.

For example, in the farm sector, success in generating skilled employment will depend upon success in linking the primary, secondary and tertiary sectors of economic activity in a mutually reinforcing manner. A dynamic and socially relevant services sector needs to be developed but this will call for a new deal for the self-employed. At present, all the deals are only for those having employment in the organised sector, Dr. Swaminathan observed. If the goal of work for all is to be achieved, the path of Gram Swaraj outlined by Gandhiji should be followed. Unfor
bureaucratic attitude promote
ing that the Government
everything and people cou
passive spectators, Dr. Swa
said.

In order to help discussion
of national importance, and
with consensus view-point of
and technologists, he sugges
nising a forum on "Science, So
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National Science Academy, th
Academy of Sciences, the
Science Congress Association
National Academy of Sciences
tributing to and for deriving
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1988-89. The rapid progress
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Department of Non-Con
Energy Sources (DNES

GTD setting up knowhow information centre

the Director General of
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setting up a technology
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this in Bangalore
GTD, Mr. H.C. Gandhi,
main objectives of the
e to collect, analyse, and
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, who was inaugurating a
ar on "Emerging technol-
enges and opportunities"
the Confederation of
dustry (CEI), stressed the
substantial efforts towards
d research and development.

The country's current expenditure in R and D, according to him, is a mere one per cent of the GNP as against 2.5 per cent to four per cent elsewhere in the world. "This is an unsatisfactory situation," Mr. Gandhi commented. Besides, while a substantial portion of the R and D expenditure in the industrialised countries came from the industry itself, in India, the Government played a major role, "Industry must, therefore, lay greater stress in this direction," Mr. Gandhi said.

The technology advisory groups, set up by his office to undertake studies on the perspective technology scenario in respect of a few important industries, had assessed the existing technology in the country in terms of quality, design with manufacturing techniques, and the status of contemporary international technology.

This had helped identify technology as are relevant to the country. A few more areas had been added recently for similar studies. Speaking on the occasion, the CEI Chairman (Southern Region), Mr. V. Ramakrishnan, stressed the need to foster an indigenous base for technological development.

Pointing out that the use of modern cybernitics and informatics technologies are opening up new patterns of industrialisation, Mr. Ramakrishnan said that this has given an opportunity for the country to bring out cost-effective decentralised modes of production.

Others who spoke were the past chairman of CEI (Southern Region) Mr. Kumar Mahadevan and the convenor of the Engineering Services Panel of CEI (Southern Region), Karnataka, Mr. C.P. Rangachar.

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Industrial policy to be recast

The industrial policy will be changed "radically, drastically and substantially" with special emphasis on employment generation, poverty alleviation and thrust to rural development, the Planning Commission Deputy Chairman, Mr. Ramakrishna Hegde, announced recently.

While there is no going back on mixed economy, investments in the public sector would be reviewed to ensure the accountability of the units in the sector, particularly in terms of discharge of social obligations, Mr. Hegde said.

"Our belief is socialism must serve some social purpose. This does not necessarily mean privatisation", adding "unfortunately now in the name of public sector, everything goes including five-star hotels."

Briefing newsmen on the three day deliberations of the wholetime members of the reconstituted Planning Commission, Mr. Hegde said a draft Approach Paper to the Eighth Plan (1990-95) will be ready by the end of January 1990.

The Approach Paper will be considered by the National Development Council (NDC), Mr. Hegde said.

Apart from NDC, the Approach Paper would be taken up at regional meetings of Chief Ministers. The first regional meeting would be held in February with Chief Ministers of the Southern States.

Asked about the 1990-91 Annual Plan, Mr. Hegde said this was being prepared on the basis of available data regarding resources. This would be done before the Approach Paper was finalised.

The changes in the industrial Policy Resolution of 1956 and subsequent Government statements in this regard would be finalised soon after wide-ranging discussions with captains of industry.

Mr. Hegde said the Approach Paper would be drawn up in accordance with the policies, programmes and priorities of the new Government and also the ideology of the National Front Government.

In the meanwhile, the Commission would also have the views of various representatives organisations like the Chambers of Commerce and Industry, since there "is going to be a radical change" in the industrial policy.

The consultation with the captains of industry was to ascertain whether they were prepared to invest in the priority areas set by the new Government.

Replying to a question, Mr. Hegde said the working of the public sector units, particularly in the spheres of steel, petrochemicals, fertiliser and power would be reviewed. This exercise would be designed to take "corrective action" and remove weaknesses that crept into the functioning of the sector.

Mr. Hegde said there was consensus at the meeting on the need to reduce the number of Centrally-sponsored schemes. "We would rather have more and more of panchayat, district and zilla parishad sponsored schemes than Centrally-sponsored schemes,".

How drastically these schemes should be reduced will be decided by "the end of January 1990." Jawahar Rozgar Yojana and Nehru Rozgar Yojana would be recast, and their names will be changed with "good ones."

Mr. Hegde said local institutions would have a decisive role in choosing the kind of employment to be provided to the rural unemployed. There course, be direct funding to pan institutions but not from "Prime ter to District Magistrate".

The State Governments "will bypassed and we will function the federal framework". The fund the local bodies would be throu concerned State Governments".

He would not be able to say an immediately about resources fo Eighth Plan and measures to m them. For this purpose, he would discussions with the Finance Min

The Commission would also ha await the recommendations of the Finance Commission which had al submitted its report to the Presi

Asked about the growth target f Eighth Plan, Mr. Hegde said this be indicated in the Approach Pape however, pointed out that whate the growth rate, it should have rele to the welfare of the people.

No doubt the growth rate in th five years had been extremely goo much more than in many other d oping countries, but what were results? Did it in any way lesse intensity of the mounting unem ment problem?

The new Government as well a previous ones had been talking of erty alleviation and what was th ference, Mr. Hegde was asked.

He said the only difference is th present Government has the "co tion and will to do which the pre Government lacked."

Regarding changes in the in policy, Mr. Hegde said agric based industries will get a more tant role under the present sche things.

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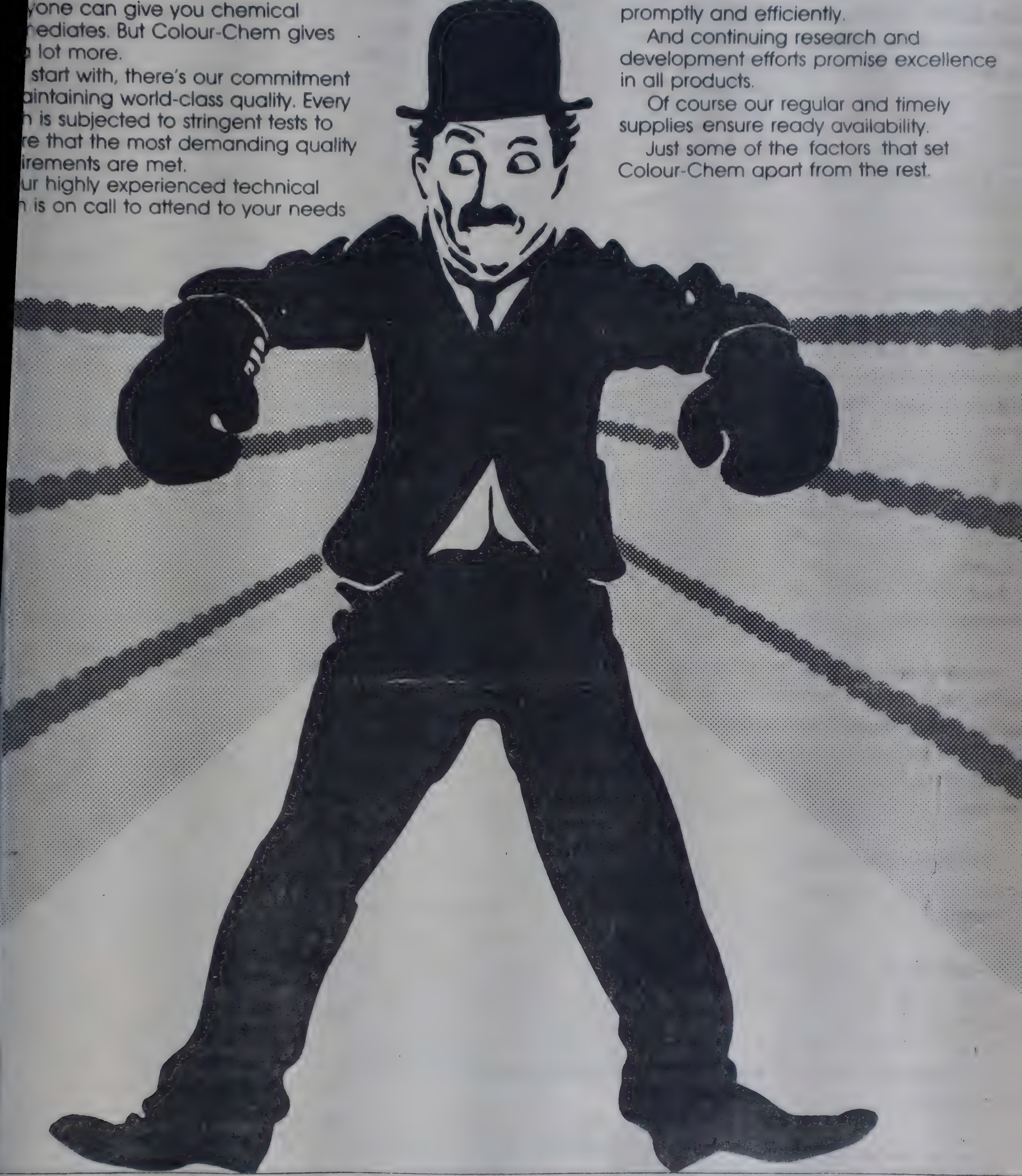

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GSFC sees scope for more plastic units

The Gujarat State Fertilisers Company (GSFC) Managing Director, Mr. P.V. Swaminathan, has urged the State entrepreneurs to set up industrial units based on the plastic raw materials of GSFC.

While delivering the keynote address at the meeting of "Plastic processors and entrepreneurs" held in Bangalore recently, he assured that the growing demand of different plastics raw materials would be met by GSFC as the company's Rs. 1200, crore expension and diversification programme was under implementation.

He particularly referred to the great scope for development of the small scale units based on GSFC's acrylics which would in turn create job opportunities for the people of Karnataka.

Mr. Swaminathan said the consumption of GSFC's plastic in the country was 13,800 tonnes and this could go upto as high as 21,500 tonnes. Similarly, the consumption in the southern region was 1930 tonnes and in Karnataka it was 315 tonnes which could go up to 2600 tonnes and 500 tonnes respectively.

The main reason for the faster growth of various plastics in the country was the change in the lifestyle of different segments of the people and particularly the changing preferences of the middle-class for plastic house-hold materials.

The plastic industry was one of the important components of India's ongoing industrial revolution and the GSFC had played a pioneering role in the development of plastic industry in the country, he added. Mr. S.R. Mody, company's Chief Marketing Manager, in his address said the
accounted for around
sales of the GSFC turnover
that in an age of consum
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ing fast and growth rate
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than ever before. Mr
Chief Marketing Manager
applications development
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Speaking on the occasion
man of the CEI (Southern
R. Ramakrishnan, stressed
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using technology develope
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ew prospects in 1989.
these were Batun-
mangalam, Lingala (Southern Region), Khoraghat (Assam) and Kutch offshore. Three major hydrocarbon discoveries were made in the Southern Region during the period. The Southern Region is poised for more than a ten-fold increase in production in the Eighth Plan compared to the Seventh Plan. A regional grid is also being planned for optimal utilisation of the hydrocarbon areas.

A memorandum of understanding (MoU) was signed between ONGC and British Petroleum for co-operation in the exploratory work in the Himalayan foothills and Ganga valley, says an ONGC report from Guwahati. ONGC's efforts to internationalise its operations received a big thrust with the signing of agreements for exploration and consultancy with a large number of international companies.

During the year, ONGC had also entered into a production sharing agreement with Agip (Italy) for exploration of an off-shore block in Sarawak, Malaysia. Meanwhile, ONGC completed the seismic surveys in offshore Vietnam.

U.V. RAO JOINS RIL BOARD

Mr. U.V. Rao, Managing Director and Chief Executive Officer of Larsen & Toubro Ltd., has joined the Board of Directors of Reliance Industries Ltd. Mr. Rao has been associated with L&T since 1956. From a sales manager in 1957, he rose to the position of executive director in 1973. In this capacity he held various positions including charge of L & T's associate and subsidiary companies. Mr. Rao resigned from L & T's board in end December, 1988 and joined the United Breweries group as President of electronics and energy products.

On April 28, 1989, he was back to the L & T Board as Chief Executive Officer.

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Iran suggests trans-Asia gas pipeline

An Iranian proposal for a 3,300-km trans-Asia natural gas pipeline from Bandar Abbas (in Iran) to Calcutta, costing $ 11,700 millions, symbolising an "Asian energy initiative" was among the high points of the last day's proceedings at the 12th annual conference of the International Association for Energy Economics (IAEE) recently.

The conference was formally closed with a valedictory address by the former Defence Minister, Mr. K.C. Pant. The valedictory session was also attended by Mr. Hiren Bhaya, former member of the Planning Commission.

The proposal for the pipeline was made by the Iranian Deputy Minister of Mines and Metals, Mr. Ali Shams Ardekhani. He was delivering the 'distinguished address', which started off the final day's proceedings at the conference.

Mr. Ardekani, who is a qualified energy economist -- having been among the pioneers in the field of solar energy economics, said that gas from Iran could be piped for use in India and Pakistan. He envisaged a 100 cubic metre-per-day pipeline from which Iran, Pakistan and India would draw 10, 20 and 70 cubic metres of gas daily respectively.

The Iranian Minister said the pipeline could be laid from Ahmedabad to Calcutta. The cost of gas at the Indian border would be of the order of $1.6 per million units, against the current Indian gas cost of about $3.6 per million units. More important, according to Mr. Ardekani, the pipeline would save precious hard currency now used for oil imports, both in India and Pakistan.

Mr. Ardekani noted that India imported at the rate of over 4.5 lakh barrels per day of oil, this import bill absorbing (even at low oil prices) about one-fourth of India's hard currency earnings. The situation was similar in Pakistan. In keeping with the conference theme of 'Energy, environment and development', he was "presenting a solution for the sub-continent's energy problem, which provides cheaper and cleaner energy than oil and coal, and in the process, will create jobs and technology transfer to participating countries.

In a short interview with the press Mr. Ardekani said he was a great votary for "sending our gas eastwards, instead of the long-standing trend to export it westwards." Europe has an insatiable appetite for energy", he said, adding that Iranian natural gas accounted for one-fifth of the world's reserves. Dispelling Western apprehensions about the pipeline in the light of the political and military tensions in the region, Mr. Ardekani said the pipeline "would be a good vehicle to reduce tensions."

"If Brezhnev can do it by succeeding on the Trans-Siberian pipeline project despite opposition, we can also do it.

Countries of the region will have to learn that "if you're poor and belligerent, it will cost you a lot." Specifically for India, the pipeline would be a worthwhile cost-effective investment in the long term. "It's always yours, anyway. You can also transport other things through it, when it is not occupied transporting gas. Even water, for instance. "Probably even other new energy resources, since the age of hydrocarbons is anyway getting over".

"Energy issues are different for the West and for the developing countries. They deal with rising energy consumption levels in the context of per capita incomes ranging around $15,000, whereas for us the per capital incomes is still around $4,500." The problems and priorities are thus different, although the IAEE conference provided ample meeting ground around the problems of the greenhouse effect, and global warming.

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Kashmir, Punjab, Haryana, Himachal Pradesh and Western Uttar Pradesh. Rajasthan, Gujarat and Madhya Pradesh and Union Territory of Delhi constituted 38 per cent of the national demand for light and middle distillates namely motor spirit, kerosene and diesel.

The current deficit of petroleum products for this region is about three million tonnes. The deficit is estimated to go upto about nine million tonnes by 1992-2000 and 15 million tonnes by 2004-2005 even after considering operation of the six million tonne Karnal refinery in Haryana by 1995-96.

But the Karnal refinery itself has been inordinately delayed and the Soviet Union which is aiding the project, has asked the government to expedite it.

Oil industry sources claimed that the economic evaluation carried out by the Planning Commission's project appraisal division indicated that the economic cost of transportation by railways would be 2.5 times higher than that of the pipeline.

The sources said even without considering any investment on track and ignoring transit loss the present value of capital and operating cost of the pipeline would work out to Rs. 542 crore vis-a-vis Rs. 1365 crore of the railway option.

However, the railways have challenged the authenticity of the data during the deliberations of the PIB. The oil industry sources said cost of transportation by pipeline would work out to Rs. 188 per tonne against Rs. 265 per tonne of the railways.

The railways have estimated that about 700 km of railway track, that is fifty per cent of the total length, was required to be converted to broad guage on the Kandla-Bhatinda route at an estimated investment of about Rs. 450 crore.

But oil industry sources argue that the railways would have to invest an additional Rs. 400 crore by way of rolling stock. These sources claim that total investment of railways for movement of six million tonne products was estimated at Rs. 850 crore and corresponding investment for movement by pipeline would be about Rs. 650 crore.

The sources quoted a report of the Planning Commission steering committee on perspective planning for transport development that transportation of petroleum products by pipelines could be economical for demand levels greater than 1.25 million tonnes, and at present about 2 to 2.5 million tonnes of petroleum products are moved by railways from Kandla.

BALCO OUTPUT UP

Bharat Aluminium Ltd. (BALCO) has registered an all round increase in production during the quarter ended December 1989.

The output of 24059 tonnes of saleable metal during October-December, 1989, was higher than the previous quarter as well as the corresponding quarter of last year which stood at 23,546 tonnes and 23,867 tonnes respectively.

The production of alumina hydrate stood at 47,705 tonnes during the same period, which is also higher than the figure of 46,220 tonnes and 44,745 tonnes during the previous quarter and corresponding quarter of last year.

NEW PRESIDENT FOR IICHE

The Director (Operations) of the Indian Petrochemicals Corporation Limited (IPCL), Mr. K.N. Venkatasubramaniam has been elected President of the Indian Institute of Chemicals Engineers (IICHE) for the year 1990, an Indian Petrochemicals Corporation Limited spokesman said in Baroda.

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of 30 to 60 suns (about 500000 W covering a 10-ft² surface) onto flowing water carrying TiO_2 as a photocatalyst. In less than 15 secs, 30 ppms of salicylic acid was reduced to p.p.b levels.

Ultraviolet light initiates the process by kicking TiO_2 electrons into a conduction band creating positively charged holes. The electrons and holes react with water, dissolved O_2, and added H_2O_2 to generate hydroxyl radicals and peroxide ions. These reactive species oxidize any dissolved organics to CO_2, water and simple acids that can be neutralized.

In their demonstration project salicylic acid and catalyst mixture flow through either a long glass tube surrounded by a parabolic trough to focus the light, or over an 11-ft waterfall illuminated by up to 20, 400 ft² heliostat (sun-tracking mirrors). The researchers also report that despite the intense solar light, flow rates of 20-70 gal/min. kept temperatures below 70°C. (*Andl. Chem*, 7/15/89, p. 834 A).

N-PHENYLMALEIMIDE — A NEW SPECIALTY CHEMICAL FOR ABS PLASTICS

Aristech Chemical Corporation (USA) has developed its first specialty chemical called N-phenylmaleimide. It is a monomer based on two staple Aristech products aniline and maleic anhydride. This new specialty chemical was produced with technology by the company's research group in cooperation with its specialty chemical group. The N-phenylmaleimide is used in conjuction with plastics such as ABS to improve their heat distortion properties. It will have a big market in plastics used in auto industry. Automakers are looking more towards plastics for reducing car weights. They are concerned about sunlight exposed parts of plastics which are vulnerable to heat distortion. Aristech is betting that addition of the new chemical which combines with the [illegible] through some copolymerization, will help overcome heat problem (*CMR*, *9/25/89*, p. 9).

CARBON DIOXIDE GENERATED FROM COAL FIRED PLANT PUT TO PRACTICAL USE

Researchers at Argonne National Laboratory (Chicago) have found that increasing the amount of carbon dioxide produced from coal-fired plants may help to eliminate its emission. Specifically they have developed a method for burning coal in a mixture of pure oxygen and recycled coal combustion gases to increase the content of carbon dioxide from 15 to 95%. The CO_2 that the process yields could be used for a number of applications such as enhanced oil recovery operations, in granaries, or in refrigeration systems.

Use of the process would react in a coal-fired plant that essentially is emission – free, according to Argonne researchers. In enhanced oil recovering the carbon dioxide would be used to help oil flow more freely. Also when added to nitrogen, the mixture could be used instead of air in grain silos to reduce fire risk and rodent damage inside silos, or the waste gas could be used in refrigeration systems that employ carbon dioxide as the working fluid to remove heat. (*R & D*, 12/1988, p. 3).

GENERAL ELECTRIC UNVEILS NEW POLYMERIZATION TECHNOLOGY FOR ENGINERING THERMOPLASTICS

General Electric Co. (USA) has recently unveiled a new polymerization technique that may expand the market for thermoplastic resins by making them easier to process. The formulators can now work starting with resins that flow [illegible] like light machine oil. The [illegible] components are usually [illegible] of graphite or glass fibres embedded in a plastic matrix. The reinforcing fibres must be infiltrated by a liquid resin, typically a thermosetting resin, that must flow readily to fill all voids and assure a solid bond once the material hardens.

Current engineering plastics are too viscose to penetrate fibre bundles easily. To solve this problem with polycarbonates the firm uses precursors having cyclic atomic structures. The rings on these precursors have the same chemical composition as the polycarbonates but only one-fiftieth their molecular weight. They flow readily when melted. A catalyst opens the rings and hooks them together in long linen chains having the polycarbonate's physical properties. The firm's proprietary research has focussed on engineering resin cyclics, particularly polycarbonates, polyetherketones. 'While this technology is still in its infancy with respect to processing and potential applications, the company believes that this breakthrough will open the way to a new era for engineering thermoplastics' reports Dr. J.W. Verbicky. In particular it holds long range possibilities for a new generation of cost-effective, light weight, thermoplastic composite materials.

This six year old technology has spawned over 50 US. patents. The firm has also developed catalyst formulations with varying trigger points that polymerize the resins in seconds or minutes. The new cyclic materials are solid at room temperature. They melt at approximately 200°C and are polymerized at 250°C to 300°C. (*CMR*, 9/25/89, p. 40).

AN ALTERNATING METHOD TO PRODUCE FORMALDEHYDE FROM BLEACHING POWDER FOR POULTRY INDUSTRY

Formaldehyde gas for fumigating poultry buildings, incubators and hatching eggs is often produced by the simple but hazardous method of mixing liquid formalin permanganate.

Now Japanese researchers from the Gifu Experimental Station have devised an alternative method, using bleaching powder, instead of potassium permanganate. Researchers have shown conclusively that the concentration of atmospheric formaldehyde made from formalin with the same weight of bleaching powder was similar to that produced using the traditional potassium permanganate method. (*Japanese Poultry Science (1989)*, 26-23-28) and (*Poultry Intl.* 9/1989 p. 24).

ARTIFICIAL INTELLIGENCE IN PROCESS CONTROL

A timely and practical publication in USA examines all aspects of artificial intelligence (AI), expert systems and knowledge-based development of process control and management. The publication contains detailed information on ways to apply AI to typical process control problems and focusses on procedures for monitoring, adjusting and optimizing continuous flow processes. It presents methodologies, techniques and solution strategies for solving real industrial problems.

With coverage of process control development in both traditional computing environments and predesigned expert system shells, the text also demonstrates methods for managing large-scale intelligent automation projects. Discussions are devoted to many important topics, including simulation, statistical process control, scheduling, operator decision support, integrated AI and distributed AI.

Also described are such subjects as domain-dependent solution shells, knowledge engineering and project organization, alarm management, cooperating expert systems and development and delivery environments. ("*Artificial Intelligence in Process Control*". By Michael Stock, 6 by 9 inches, 210 pages. McGraw Hill Publishing Company, 11, West 19 St., New York, N.Y. 10011. Price $37.50.)

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on high process technology licensed from Japan's Mitsubishi Petrochemical Co. The new catalysts were unveiled on the occasion of the opening of the company's new research facilities near Brussels (Europe), by the President John R. Webb. Although declining to specific the nature of the new proprietory catalysts, he predicted they will lead to a variety of polymers with improved performances features for the automobile, textile, packaging, adhesives, and electrical end-use markets. (*C & EN*, 9/18/89, p. 20).

MOLECULAR SEIVE SENSORS ON THE HORIZON

Zeolite-silica thin films with molecular sieving properties have been prepared and coated on surface acoustic wave (SAW) devices to impart chemical selectivity report researchers of the dept of chemistry, University of New Mexico and researchers at Sandia National Laboratories.

SAW devices are sensitive prezoelectric balance that respond with frequency changes when substances adsorb on their surfaces. Because this response is iron-selective a number of coatings have been explored to impart chemical selectivity. New coating of a SAW device with zeolite silica thin films has resulted in sensors able to detect selective adsorption of organic vapors. Whereas vapors of methanol and propanol adsorb on the film, response of the sensor to iso-octane was minimal because the molecule is excluded by the small pore size of the Zeolite film. 'A striking difference in frequency response to different probe molecules was observed' the researchers report. (*J. Am. Chem. Soc.*, 111, 7640 (1989)) and (*C & EN*, 9/25/89, P. 32).

A NEW STABLE METHYLATING REAGENT

A methylating reagent that is as reactive as lithium dimethylcuprate but that is easier to handle and can be stored at room temperature has been developed at Lithium Corpn. of America, (Bessemer City, North Carolina, USA). The company is now sending research samples of lithium methyl (2-thienyl) cuprate to several parties and may begin commercial scale production in 1990. Research chemist Helen B Hatch made the reagent by treating a toluene solution of the dimethyl sulfide adduct of cuprous bromide with a solution of methyl lithium and 2-thienyl lithium in toluene and tetrahydrofuran. She made 2-thienyl lithium from reaction of thiophene with either methyl -- or butyl lithium.

Solutions lost no active methyl content on storing for 10 weeks at room temperature. This contrasts starkly with lithium dimethylcuprate, which is tricky to make and must be used at once. Hatch's future work includes investigation of such other lithium alkyl (2-thienyl-cuprates as market research indicates may be commercially viable. The Company's first customers will probably be laboratory chemical suppliers for repackaging and sale in small quantities. But the stability and ease of handling of the reagent may lead to the first widespread use of cuprates to make pharmaceuticals, pesticides, flavor and fragrance chemicals and pheromones. (*C & EN*, 9/25/89 p. 40).

A NON-POLLUTING ULTRAMARINE PIGMENT DEVELOPED

Relatively non-polluting technology to make a pigment related to ultramarine (Pigment Blue 29) has been developed by materials science Professor Rosemarie Szostak at George Institute of Technology. The researchers costs a zeolite of proper particle size with sulfur and fires it. Though small amounts of sulfur dioxide are generated, the amount is much less than with the traditional process of firing a mixture of kaolin, soda ash, sulfur and charcoal. The firing temperature in the new process, which George Tech. is patenting, also is lower, resulting in significant savings in energy costs.

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ATERIALS MANAGEMENT

t X - Inventory and its control (Contd.)

N.R. PAI

ction Quantity)

cond mathematical model employed
m viz. EPQ (Economic Production
ulating EPQ four different costs are

per year

h is the sum of these first three costs.

e when annual demand (D) in units
per unit C are known. Then
tion cost = D x C

nual demand in units, then, D/Q =
ns per year where, Q = size of the
w, if set up cost per production run
cost for all the production runs taken
be,

ction produced but not sold and the
on is discussed later separately*.

TC)

+ Holding cost of unsold production

taining holding cost of production

duction, say 8 hours (1 shift), Q =
e t_1. The rate of production 'rp' is

$$rp = \frac{Q}{t_1} \quad \text{-- (i)}$$

Now, If rd = rate of demand for the item by the customer (it corresponds to the rate of sale by the supplying organisation) during time t_1 then rate of inventory accumulation can be given by rp-rd units/hour (i.e. units in unit time provided rp>rd)

Therefore maximum inventory during time t_1 = rate of inventory accumulation (per hour) x number of hours.

$$= (rp-rd) \times t_1 \quad \text{-- (ii)}$$

This argument can be further clarified by the following example: Consider a company producing 100 plastic tumblers per hour, out of which 98 are sold per hour. Then we have, production rp = 100 tumblers per hour and demand (sales) rate rd = 98 tumblers per hour. So, the rate of inventory accumulation (per hour) = rp-rd = 100-98 = 2 tumblers per hour.

Therefore maximum inventory accumulation in one shift i.e. in 8 hours or in time t_1 will be = $(rp-rd) \times t_1$ -- (ii

$$= (100-98) \times 8 = 16 \text{ tumblers.}$$

Now, in general and as seen while developing EOQ model,

$$\text{average inventory} = \frac{\text{Maximum inventory}}{2} \quad \text{-- (iii)}$$

But as per equation (ii) maximum inventory = $(rp-rd) \times t_1$.

$$\text{Therefore average inventory} = \frac{(rp-rd) \times t_1}{2} \quad \text{-- (iv)}$$

Referring to equation (i) we have $rp = Q/t_1$

Therefore $t_1 = Q/r_p$. Substituting this value of t_1 in (iv) we have,

$$\text{average inventory} = \frac{(rp-rd) \times t_1}{2} \quad \text{-- (iv)}$$

$$= \frac{(rp-rd)}{2} \times \frac{Q}{rp} \quad \text{-- (v)}$$

For cross check, when rd=0 average inventory becomes

$$\frac{\text{[illegible]} \times Q}{\text{[illegible]}}$$

[illegible]

$$= \frac{rp \times Q}{2rp} = \frac{Q}{2}$$

Now, if H = annual cost of holding one item; then overall holding cost is given by = average inventory H

$$= \frac{Q \times (rp-rd) \times H}{2rp}$$

Therefore total cost TC is given by

$$TC = DC + \frac{DS}{Q} + \frac{Q(rp-rd)}{2rp} \times H \quad \text{-- (vi)}$$

production cost set up cost holding up cost (of production unsold)

Now, we want to ascertain that value of Q where TC will be minimum. In other words for EPQ TC should be minimum. To get this value we have to differentiate TC with respect to Q. Now we have from equation (vi)

$$TC = DC + DSQ^{-1} + \frac{Q(rp-rd)}{2rp} \times H$$

On the right hand side only Q is variable and the rest are constants. Thus differentiating TC with respect to Q we have

$$\frac{d(TC)}{dQ} = (-1)DSQ^{-2} + \frac{(+1)Q^{\circ}(rp-rd) \times H}{2rp}$$

$$= \frac{-DS}{Q^2} + \frac{(rp-rd) \times H}{2rp}$$

Now, for TC to be minimum $\frac{d(TC)}{dQ} = 0$

i.e. $\frac{-DS}{Q^2} + \frac{(rp-rd) \times H}{2rp} = 0$

Therefore $\frac{DS}{Q^2} + \frac{(rp-rd) \times H}{2rp}$

Invert L.H.S. and R.H.S.

$$\frac{Q^2}{DS} = \frac{2rp}{(rp-rd) \times H}$$

Therefore $Q^2 = \frac{2rp \quad DS}{(rp-rd) \times H}$

Therefore $Q = \sqrt{\frac{2rp \quad DS}{(rp-rd) \times H}}$

Where Q = Economic Protection Quantity (EPQ). It is worth noting that this model assumes that stock out situation does not arise i.e. rp>rd and again (rp-rd) = negligible quantity.

To get fixed in mind the concept of EPQ and to the practical applicability of this model we can following problem to be solved by EPQ formula.

A company manufactures a particular product an annual demand of 30,000 units. The rate of of this product is 120 units a day, and the cost of turing each unit is Rs. 40. In a year the company 300 days. The set up cost per production run is Rs. the yearly holding cost works out to Rs. 9 per unit. data we have to calculate EPQ as also the number duction runs per year.

Assigning our usual denotations for ease of have:

1. Annual demand in units = D = 30,000 units.
2. Cost of production per unit = C = Rs. 40.
3. Set up cost per production run = S = Rs. 18.
4. Production rate = rp = 120 units a day.
5. Holding cost per unit per year = H = Rs. 9.
6. Size of production run = Q (EPQ) to be

Here, production rate is given in terms of while demand rate is given on yearly basis. To on the same scale we convert demand rate in terms per day as follows:

Demand per year is 30,000 units and since there are ing days in a year rd (demand rate per day) = = 100. Now, applying the formula we have,

$$EPQ = \sqrt{\frac{2rp \ DS}{(rp-rd) \times H}}$$

$$= \sqrt{\frac{2 \times 120 \times 30{,}000 \times 18}{(120-100) \times 9}} \quad \text{(By value}$$

$$= \sqrt{720000} \quad \text{(on solving)}$$

= 848.5281 (on solving).

= 849 or say 850 in round figures.

Number of production runs will be given by = 30000/850 = 35.294 or say 35.3.

However, if 900 is chosen as a convenient number using human judgement, then the number of work out to 30,000/900 = 33.33.

Back ordering

Sometimes demand for a product organisation is in excess of that which is planned cases, generally the shortfall in the supply of the to be met with by the supplier. He then solves his

s shortfall from the following production run.
f supplying shortfall in the items from the sub-
ction run is known as back ordering. Now, this
incurs additional expenditure to the organisa-
, it keeps up the patronage of loyal customers.
e of the organisation is not lost even if it faces
ck out situation, with respect to its products
. Back ordering, however, is possible only with
yal customers. It is a necessity in case the pro-
opoly item. In the previous case customer pre-
till he is served from the next production run
utstanding orders, rather than switching over to
lier.

cost associated with back ordering is worked
ely, corresponding EPQ can be computed by
following modified form of this mathematical

$$\sqrt{\frac{2rp\ DS}{(rp\text{-}rd) \times H}} \times \sqrt{\frac{H + K}{K}}$$

Here, K stands for the cost per unit per year associated with back ordering. Now, if in the above examples back ordering cost per unit works out to Rs. 6 i.e. $K = 6$, then by substituting the value of K in the above formula we get,

$$EPQ = \sqrt{\frac{2 \times rp \times D \times S}{(rp\text{-}rd) \times H}} \times \sqrt{\frac{H + K}{K}}$$

$$= 849 \times \sqrt{\frac{9 + 6}{6}}$$

$$= 849 \times \sqrt{5/2}$$

$$= 1341.42 \text{ units (on solving).}$$

Note that we have already calculated value of

$$\sqrt{\frac{2 \times rp \times D \times S}{(rp\text{-}rd) \times H}}$$

which works out to 849.

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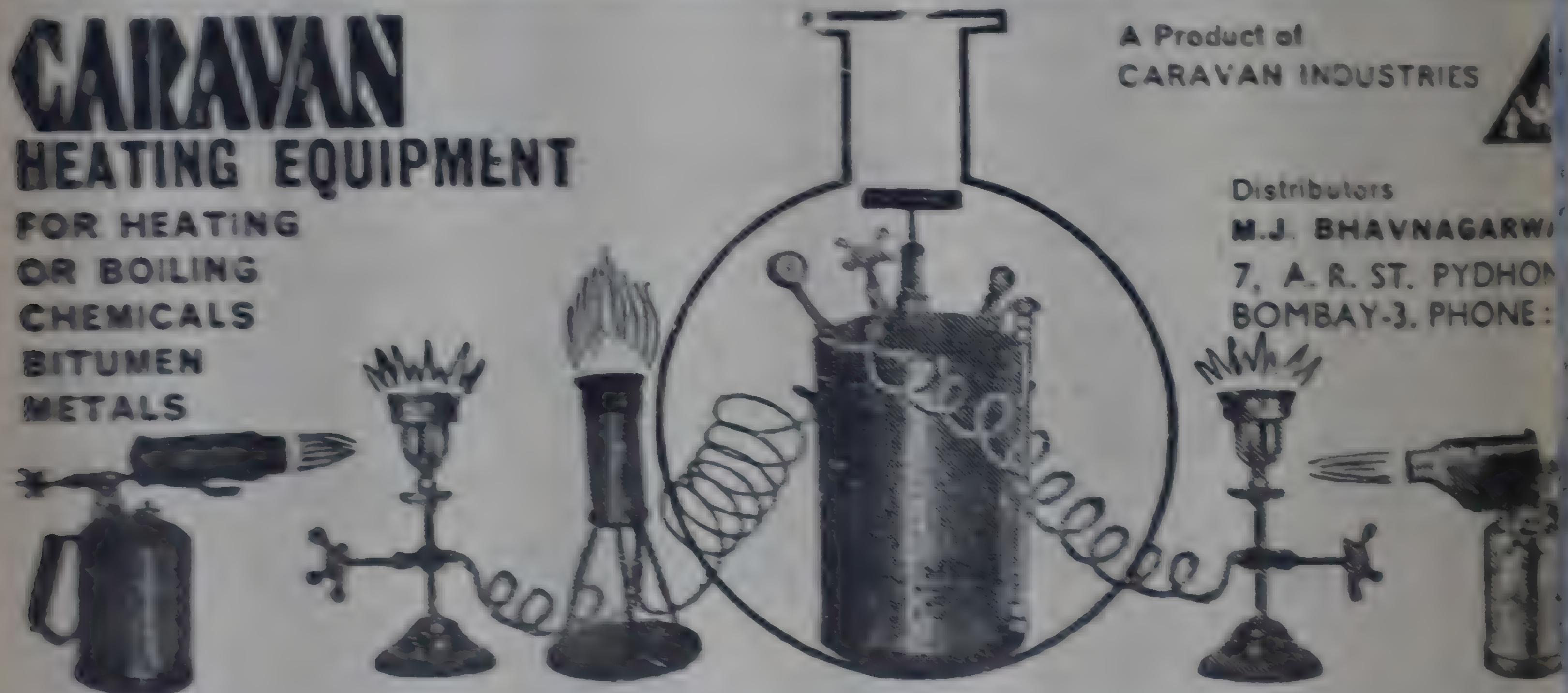

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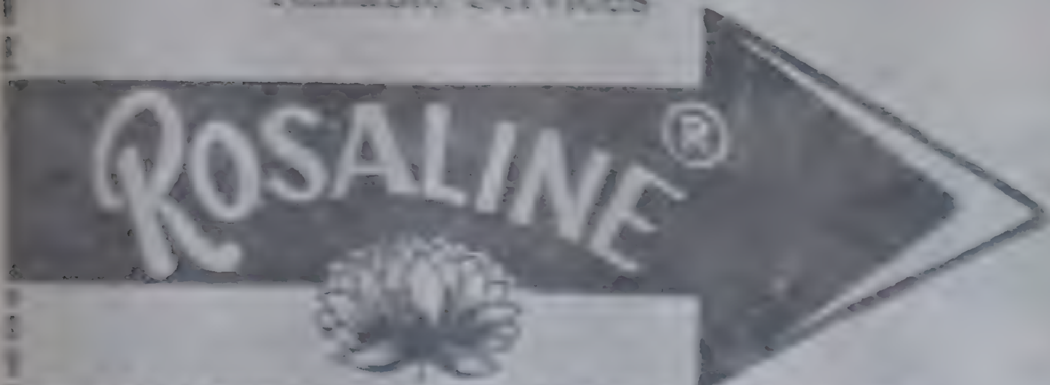

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production of antibodies to the FSH. These antibodies react with the natural FSH and induce infertility.

The vaccine has no effect on male libido and is totally reversible. Dr. Moudgal said. After the injections are stopped, the sperm count goes up and the animals became fertile again.

Their tests on the monkeys indicate that for effective vaccination, three to four injections would be required during the first year and less than two per year subsequently.

ANCIENT HERB IS ANTI- GERMICIDAL, ANTI- INFLAMMATORY

An ancient herb dating back to the Atharvaveda has recently been confirmed to possess anti-bacterial, and anti-inflammatory properties.

The rhizomes of the herb, Acorus calamus, commonly known as sweet flag, which find mention in ancient Ayurvedic texts, are reputed to be effective in the treatment of mental ailments like insomnia, melancholia, neurosis, hysteria and loss of memory. Scientists have already extensively studied the herb for its effects on the central nervous system and isolated two active substances, alpha and beta asarone, from it. It has also been attributed with germicidal properties.

Scientists at the Institute of History of Medicine and Medical Research, New Delhi, prepared an extract of crude dried roots of Acorus calamus in ethanol and concentrated it to form a crude drug material which they referred to as AC-1. Using albino rats and mice, the team studied the effects of the crude drug on various Gram-positive and Gram-negative bacteria and as an analgesic and anti-inflammatory agent.

AC-1 [illegible]

anti-bacterial activity, and the effect was more evident against Gram-positive bacteria, a report of the scientists' findings in the "Annals of the National Academy of Medical Sciences" says.

It was also found to possess "significant" anti-inflammatory activity in cases of arthritis, oedema and granuloma in the experimental animals.

But the drug did not show any analgesic or anti-pyretic action, the report by Dr. S.B. Vohra and co-workers in the journal said.

The study confirms the germicidal property attributed to this drug in ancient Ayurvedic texts and gives a rational basis to claims of its efficacy in treating inflammatory conditions in Unani medicine.

GRAPHITE TAPE/SHEET FROM NATURAL GRAPHITE

The National Physical Laboratory (NPL), New Delhi, has developed the know-how for the manufacture of graphite tape or sheet which can replace asbestos as a sealing agent for gaskets and packings.

Graphite tape/sheet is a binderless product obtained by compression of exfoliate graphite material particles.

NPL has developed flexible graphite from natural graphite obtained when treated flakes are washed with water and dried. The soggy treated flakes are then heated to a suitable temperature which make them expand in the direction upto 30 times that of the original sample thickness. The end product is then pressed into a foil which is flexible in nature.

The exfoliated graphite is impermeable to gases and liquids and is a good [illegible]. It is [illegible] and can be used from minus 200 degrees to 500 degrees Celsius in an oxidising atmosphere and [illegible]

Celsius in an inert or reducing atmosphere. It is not wetted with flasos or metals and does not age or creep. The product is self-lubricating, easy to cut and punch and resistant to radiation and corrosion.

At present, it is being imported, but demand for it is expected to increase with indigenous production. The cost of production is only Rs. 800 per kg. says a report in "Invention Intelligence".

BLUE DUST -- A PRECIOUS MINERAL

Big pockets containing blue dust, a precious mineral have been found in some mines of National Mineral Development Corporation (NMDC) in Bailladila.

Blue dust, which is very rich in iron, can be used to produce sinter for use in the blast furnaces of the integrated steel plants in India. It can replace 10 per cent of the fines in the production of sinter. Industrial applications of blue dust in powder metallurgy, electronic industry and welding industry are also under study.

According to NMDC authorities, the reserves of blue dust in Bailadila-14 are expected to be about 22 million tonnes. Research and development by NMDC has established that blue dust which is pure iron combined with oxygen can be used in the manufacture of iron powder in powder metallurgy and making spare parts of automobiles.

It can also be used in the manufacture of electrodes of heating pads for use in high altitude areas by the army, high quality brake pads for the aircrafts and cold rolled grain oriented sheets.

In electronic industry, blue dust has been found suitable for manufacturing hard and soft ferrites and magnets. Blue dust pellets can be directly used in electric arc furnaces for manufacturing steel. With more research, blue dust can replace metal scrap or sponge iron as a raw material for the steel industry.

Some Japanese steel mills have shown keen interest in purchasing blue dust from India. A 3,000-tonnes-per-year demonstration plant for manufacturing beneficiated blue dust is being set up at Bailadila to manufacture ferric oxide. NMDC not only hopes to meet the demand of the ferrite industry in India but also export ferric oxide to South-East Asian countries. NMDC will soon set up a pilot plant for manufacture of iron powder.

CSIR POLYTECHNOLOGY TRANSFER CENTRE

The CSIR Polytechnology Centre in Hyderabad has emerged as a focal point amongst entrepreneurs, promotional agencies, research and development institutions and government departments during its 14 years of existence.

Set up in 1975 as a Polytechnology Clinic to carry out diagnostic studies on industrial problems, it slowly expanded its scope of activities to include transfer of technologies and assistance for entrepreneural development. It also aims to create awareness about science and technology as a vehicle for industrial developlment and solve industrial problems with the help of expertise available both within and outside CSIR.

During the last four to five years, PTC helped to transfer the vertical shaft kiln (VSK) technology for manufacturing cement, developed by the Regional Research Laboratory, Jorhat, to Andhra Pradesh. Today, four tiny cement plants are in operation, two in Guntur district and one each in Ananthapur and Mahboobnagar, while about ten more are being set up. PTC has kept in touch with the manufacturing units to ensure the quality of the product and help overcome technical problems.

Similarly, PTC has helped an entrepreneur in Andhra Pradesh, a state with
extensive deposits of high-
stone, to set up a unit for
calcium carbonate, based on
gies developed at the Centra
Marine Research Institute
Bhavnagar, and the Central
Research Institute, Roorkee

A wide variety of industri
benefitted from the assistance
by the centre, while new unit
ing factories for making pH
selective electrodes, are spring
many parts of the state.

Through active collaborat
CSIR laboratory, the National
Development Corporation and
cial agency, PTC has helped
a plant in Nalgonda district for
red iron oxide pigment, the only
its kind in Andhra Pradesh.

With a plant to manufacture
lytic manganese dioxide (EM
important constituent of dry
ready for the first phase of prod
PTC has played a crucial role
ducing EMD to the state.

Plant-based industries are also
ning to flourish with PTC's
entrepreneur in Srikakulam
planning to set up a unit based
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ges meetings between ltants, entrepreneurs and solve specific problems revival and rehabilitation and helps in modernisa- adation.

cts its activities under the nce and advice of a high- isory Committee headed tary, Industry and Com- nment of Andhra Pradesh, ntatives from industries, otional agencies, CSIR, lepartments and voluntary s. The state government, irectorate of Industries, has ng half the funding to PTC eption.

DROGEN: MOVING OSSIL FUELS

chnological advances may ne low-polluting, renewable ar-generated hydrogen gas ch to reduce the use of fossil ling to the World Research RI).

ironmental and economic es of fossil fuel combustion elt increasingly on local, d global scales. Deteriorat- i quality, forest and crop acidification of lakes and obal climate are interrelated es of fossil fuel use that are policy makers to rethink environmental policies. In re is a continued dependence on imported oil.

Foremost among the proposed remedies to reduce pollution and ease foreign oil dependence are actions to cut the use of fossil fuels in national energy diets and replace them with cleaner domestic energy supplies. Many such alternative energy sources have been proposed that address the environmental problems in whole or in part, including methanol as substitute for oil in transportation, and nuclear and solar power in place of coal in generating electricity, though not all of these choices are ideal replacements. Methanol and nuclear power are fraught with pollution, safety, and security concerns of their own.

The sun represents an ideal source of energy: clean and virtually limitless, says Washington-based WRI in the report. But, even with the advances in solar heating and electricity technologies in the 1970s, solar energy has still found only limited applications. The primary obstacles have been the high costs of producing and storing electrical energy. Solar cells can make electricity only when the sun is shining, so the problem remains of maintaining a continuous supply of electricity year-long and around the clock, even on cloudy days.

One ideal means of addressing this problem is to store and transport solar-generated electricity in the form of hydrogen. When electricity from a solar cell (or any other source) is passed through water, the water molecules are split into their constituent parts —hydrogen and oxygen — in a chemical process known as electrolysis. The resulting hydrogen gas can then be shipped through pipelines and burned to produce heat, much like natural gas, or used to power slightly modified vehicle engines. Hydrogen is also an important industrial chemical used in the manufacture of agricultural fertilizers, hydrogenated food oils and fats, and other industrial chemicals.

What makes hydrogen worth reconsidering for the 21st century is that solar photovoltaic (PV) technology is becoming cheap and efficient enough to make hydrogen competitive with synthetic fuels derived from coal. It is also preferable to other alternative fuels because it is one of the cleanest fuels available. This means that in the sunnier regions of the United States, the direct current (DC) electricity needed to produce hydrogen could be available by the turn of the century at affordable prices (2 cents to 3.5 cents per kilowatt-hour).

Hydrogen is an exceptionally clean-burning fuel -- cleaner than today's fossil fuels or proposed fossil fuel-based synfuels such as methanol made from coal or natural gas. The combustion of hydrogen emits no carbon monoxide, volatile organic compounds, or particulates, which contribute to urban air pollution, and no sulfur dioxides, a primary cause of acid precipitation. Indeed, burning hydrogen releases only water and a single pollutant, nitrogen oxide, which can be controlled successfully to very low levels.

PV hydrogen is also one of the few long-term energy supply options that can meet the world's energy needs without contributing to the green-house effect. Since no carbon dioxide is emitted during production or combustion, PV hydrogen has a decided edge over synfuels, such as methanol, which are currently being considered as alternatives to gasoline. Even if methanol lived up to its claims for improving local air quality, it would still release significant quantities of carbon dioxide and a massive shift to coal-based methanol would exacerbate global greenhouse warming.

PV hydrogen is also not constrained by the same resource limitation worries as are oil, natural gas, or uranium because it is based on renewable resources -- water and sunlight -- and on abundant raw materials -- silicon from ordinary sand in the case of amorphous silicon thin film cells. Moreover enough PV hydrogen to meet the entire fuel requirements of the United States could be produced on only 1 per cent of the US land area.

Another noteworthy advantage of PV hydrogen is that it does not require billion-dollar capital investment, as fossil fuel-based synfuel or nuclear power plants do. In fact, the capital investment needed to bring a 5 to 10 megawatt PV hydrogen plant into being is only four million to 12 million dollars.

The case for hydrogen is persuasive on economic and environmental ground, but is it safe compared to other common fuels? The very properties that make most fuels useful -- the capacity to store a large amount of readily accessible energy in a small volume -- also make them potentially dangerous. Hydrogen is no exception, but its physical properties indicate that it poses no more of a danger than natural gas or gasoline.

The first market for solar hydrogen may be the chemical industry. Currently industrial hydrogen is made primarily from natural gas. As affordable, modular PV units come onto the market, low-volume users in sunny areas could begin generating their own hydrogen supplies in the early 1990s and the rest of the industry could begin to use solar-generated hydrogen by the end of the decade.

Chemical markets will play a decisive role in the early development of PV hydrogen, but the major environmental benefits will accrue only when hydrogen penetrates transportation energy markets. Research and development for hydrogen-powered vehicles is already under way in Germany and Japan, and these vehicles could be commercially available over the next decade.

Projected advances in solar technologies indicate that PV hydrogen could become roughly cost competitive with synthetic fuels derived from coal or other sources by the early part of the next century. But energy planners have yet to look seriously at solar hydrogen as an alternative energy source for several reasons. First, the prospect of dramatic advances in thin-film solar cell technology has become clear only recently.

Second, low world oil prices have kept energy issues off the public policy agenda during the last few years, so that policymakers and the public generally are unaware of the spectacular technical and economic progress being made in the PV industry. And third, even within the PV research and development community, efforts have been focussed on the nearer-term PV electricity markets rather than on longer-term PV hydrogen markets.

As the environmental evidence against fossil fuels mounts, local and national governments are searching for ways to reduce urban air pollution, halt acid rain and stem the build up of green house gases in the atmosphere. The most promising, long-term solution is to reduce our dependence on traditional fossil fuels through energy efficiency improvements and a shift to alternative fuels that create little or no pollution.

Because hydrogen contributes much less to air pollution than these other alternatives and could become available as a transport fuel in the near future, PV hydrogen should be a part of any clean air plan.

While the United States began work on these hydrogen technologies in the 1970s, little is being done today. Hydrogen-powered vehicles, space and water-heating systems, home car-refuelling systems, and fuel cells warrant high research and development priorities. Similarly, rant high research and development PV hydrogen systems have been built and a number of conceptual designs for large plants have been developed, but until the recently proposed 600-kW Solar Wasserstoff project in West Germany, there have been no large demons
hydrogen systems.

TURNING WASTES
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TO EAT UP

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voracious, the journal said.

The new bacteria, discovered while combing through PCB-affected soil, devour more than 90 per cent of one of the most common PCB mixtures, and the scientists hope to harness purified strains and make them more viable. Developed in the 30's, PCBs were banned in 1979. An estimated 440 million pounds of PCBs have found they their way into the environment through illegal dumping and leaking electrical transformers, Omni said. At present, the PCBs can only be destroyed through costly high-intensity incineration.

POWER FROM COW DUNG

The first commercial power plant that uses cattle dung as fuel is now fully operational in the United States. Situated near El Centro, California, the Mesquite Lake Resoure Recovery project generates 17.5 MW per hour -- enough to power 15,000 homes -- and sells most of it under a 30 year contract to the town of Edison in Southern California.

Each day the plant collects 900 tonnes of manure at one dollar a tonne from nearby feedlots. The odoriferous carbon-rich dung is dried for two to three months under the sun before it is burned at 1500 degrees Fahrenheit to power the plant's steam turbines.

A former real estate agent, William Parish, who owns and manages the plant, eventually hopes to sell the ash left over from the process for possible use in road building or absorbing toxic wastes, the U.S. release said.

-- (all items) P.T.I. Science Service, Jan. 1-15, 1990.

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reactants are pushed through different flow lines in the required proportion and mixed in the manifold where the reaction takes place. The actual quantitative measurements are made in the double beam colorimeter in a sequential manner for the required parameters. The estimated cost of production is Rs. 2 lakh per unit.

INFRA-RED SWITCH

A cost-effective and multi-purpose Infra-red switch from Innosys is now available. The working principle of the infra-red 'through scanner' model is simple. An invisible infra-red beam passes between a transmitter and receiver. When this beam is broken, it emits a signal. Its applications are varied. When connected to an intruder alarm, it can serve as a highly effective security measure. Especially for banks, jewellery stores, R&D department, godowns, etc., after closing hours. By itself, it is a reliable counting apparatus. And excellent for ensuring operator safety where hydraulic presses, etc. are employed.

The Innosys infra-red 'reflective' model, suitable for position sensing of machinery, controlling of paper roll sizes, detecting web-breakage in textiles, regulating the automatic opening/closing of lift doors, etc. will also be soon available in the market. There are many more ways in which infra-red switches could be used. For details contact: Innosys Electronics & Systems Pvt. Ltd., 174/A2 Shah & Nahar Industrial Estate, Dhanraj Mills Compound, Lower Parel (W), Bombay 400 013.

LASER LIGHT SCATTERING SPECTROPHOTOMETER, THE DLS-700

The PL Separation Sciences Division of Polymer Laboratories is pleased to announce an addition to its product line - a laser light scattering spectrophotometer, DLS-700, from Otsuka. This instrument provides a precise, fast and easy way of obtaining molecular weight and size information from molecules in solution.

The DLS-700 can be operated in one of two modes, namely dynamic light scattering and static light scattering.

In the dynamic mode, fluctuations in the scattered light intensity are monitored as a function of time. The time scale of these fluctuations, conveniently analysed using autocorrelation techniques, yields values of diffusion coefficients and particle size. Size distributions for monodispersed samples are rapidly obtained by unimodal analysis.

For more complex systems on-line multimodal size analysis provides good resolution of individual species in polydispersed samples. Particles in the size range of 3nm to 3 microns can be analysed by the DLS-700.

In the static light scattering mode, measurements are made on the total intensity of scattered light as a function of both angle and concentration. Manipulation of the data is achieved through the software, by utilising the Zimm, Berry or Debye plots giving absolute molecular weight, second virial coefficient and radius of gyration.

An angular range of 5 to 150 degrees coupled with high sensitivity allows accurate determination for a wide range of molecular weight, 300 to 20,000,000 daltons.

The dual capabilities of the instrument mean that the DLS-700 offers complete size characterisation for a wide range of molecules.

For further details contact: The Publicity Manager, PL Separation Sciences, Polymer Laboratories Ltd, Essex Road, Church Stretton, Shropshire SY6 6AX. Phone: 0694 723581. Fax: 0694 [illegible]

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Sodium Sulphide

S. GANAPATHY*

ely used in the following:
the largest consumer of Sodium Sul-
of skin and hides. India is exporting
ssed leather.
In the Kraftwood pulping process,
cooking liquor.
termediates.
Intermediates.
ure of Soda Ash, Metallic Zinc etc.
tomers, ore floatation, certain lube oil
is product has been quite encouraging
present.

s routes of manufacture are as under:

lphate:
ture of rayon and sodium bichromate,
duced as by-product -(around 900 Kg.
chromate). Similarly in the manufac-
m dextrose) sodium sulphate is a by-
nhydrous sodium sulphate with carbon
rganic material or with hydrogen or
es sodium sulphide. Generally carbon
agent the reaction is normally carried
ending upon the type of carbon used,
e etc. with pine charcoal. The reaction
with graphite, petroleum coke a tem-
880°C is needed. The following reac-
e reduction furnace.

a$_2$S + 4CO ↑

S + $2CO_2$ ↑

bon gets oxidized to CO or to CO_2
e conditions and proportions of the
d carbon. If the temperature is too high
he reduction reaction is assisted by
as Na_2S or the sulphides of another
ction reaction can be carried out in a
reverberatory type) or in a Rotary Fur-
in a continuous way through suitably sized rotary kilns. Producer gas, natural gas, fuel oil etc. can be used as fuel for the furnace. As the furnace has to be operated under a totally reducing atmosphere, excess air supply or outside air entry into the furnace has to be totally stopped or controlled. by the proper monitoring of O_2 and CO in the furnace off gases. O_2 should be nil in this and there should be at least 1 - 2% of CO. In batch rotary or reverberatory Furnaces, reduction of the batch is usually completed in 1 3/4 hr to 2 and a half hrs. when operated properly. The proportion of sodium sulphate and carbon for the maximum/best yield are reported as Na_2SO_4: C = 4:1 or 3:1. Increase in proportion of carbon decreases the loss of sulphur but increases other undesirable reactions so that the yield ultimate, of sulphide is not increased but decreased.

Sulphate reduction reaction is diffusion controlled and hence the Sulphate and carbon must be below 20 mesh and intimately mixed before charging to the reduction furnace. Briquetting the charge also favours yield. The mass from the furnace after the completion of the reduction reaction - as confirmed by the (i) appearance of the roast inside the furnace (ii) analysis of a sample for sulphides (The roast has a tendency to stick to the walls of the furnace towards the end of the reduction process) is discharged for its further processing.

It is possible to achieve 60-75% conversion in the furnace. Roast is bleached with hot water (or water and live steam), and treated to remove the unreacted sulphate, carbonate (if any formed) and filtered to get clear solution of sodium sulphide. This is further concentrated to 58 - 60/62% in coal or oil fired evaporators, and packed as solid, pellet, or flaked and packed.

(2) From Black - Ash (Barium Sulphide)

Barium salts are manufactured from mineral barytes as above. Barytes on carbon reduction gives black ash or barium sulphide, which is processed as below for sodium sulphide.

(i) Reaction between barium sulphide solution and soda ash gives barium carbonate and sodium sulphide. The solution of sulphide of sodium so obtained is filtered from barium carbonate, evaporated in single or double stage to get solid sodium sulphide. Here one can get up to 58 per cent sulphide by proper process control. Ba CO_3 has good market

$$Na_2CO_3 + BaS \longrightarrow BaCO_3 + Na_2S$$
$$Na_2SO_4 + BaS \longrightarrow BaSO_4 + Na_2S$$

---

e Building, Sion (East), Road 31, Scheme 6,

(ii) Alternately black ash is reacted with hydrochloric acid in a closed reactor and the hydrogen sulphide gas produced in the reaction as detailed below:

$BaS + 2HCl \rightarrow BaCl_2 + H_2S \uparrow$

is dissolved/absorbed in caustic alkali to produce Na HS, which is further neutralized by additional caustic soda to produce Na_2S. The barium chloride has very good market.

3. From H_2S:

In case of availability of H_2S from neighbouring units or from one's own unit, this can be absorbed in caustic Alkali to finally give Na_2S as under:

(a) $NaOH\ H_2S \rightarrow NaHS + H_2O$

(b) $NaHS + NaOH \rightarrow Na_2S + H_2O$

$2NaOH + H_2S \rightarrow Na_2S + 2H_2O$

This process will give good quality Na_2S and one can even achieve upto 62% quality in the final product easily.

4. From caustic soda and sulphur:

Sulphur, as fine powder, when dissolved in excess 48/50% alkali solution at its boiling point, in the presence of little polysulphides or some selected catalysts gives mainly sodium sulphide. The reaction generally is as under:

$12S + 6NaOH \rightarrow 2\ Na_2S_5 + Na_2S_2O_3 + 3H_2O$

As can be seen from the above reaction the final product reaches upto 50 - 53% assay only. At the current prevailing price of caustic soda, the economics of the above process is poor. However there are some manufacturers in the S.S. sector, located in backward areas, following this manufacturing route.

5. From Sodium amalgam of mercury cells:

Poly sulphide of sodium is reacted with the amalgam, (part of it) from mercury cells, to get Na_2S as a solution, which is further processed to produce flakes, pellets or bits. One can produce totally iron free straw coloured sodium sulphide by doing all the processing of sulphide in nickel vessels. M/s. Travancore Cochin Chemicals Ltd. at Alwaye, Kerala, is producing sodium sulplhide by this way.

At 18°C

Sp. Gravity	% Na_2S
1.02	2.00
1.056	5.03
1.110	9.65
1.158	14.00
1.182	16.20
1.216	18.16

Crystallises beyond this.

	Sp. Gravity	
% Na_2S	30°C	40°C
10	1.10	1.09
12	1.118	1.115
14	1.136	1.134
16	1.160	1.155
18	1.18	1.175
20	-	1.196
22	-	1.216
23.25	-	1.228

Red or Red brown colour is due to iron in sulph free material is pale yellow coloured. If polysulp present, Na_2S has strong yellow colour.

Properties:

Sodium sulphide is rapidly oxidised by moist a accelerates oxidation by moist air. Hence it is neces keep storage tanks and drums of sodium sulphide clo tight as far as possible. Oxidation in solution of sul thiosulphate, sulphite etc. is accelerated by metals Co, Mn, Zn etc. Fe (OH) oxidizes it to Na_2SO_3 in so Hence long storage in M.S. tanks to be avoided.

Addition of glycerol in small quantities inhibits oxi in solution. Fused sulphide attacks gold, silver platin But has no action on graphite. Burns of sodium sulphi a long time to heal. It should not be handled by bar as the skin and nails are attacked by the sulphide. It is inflammable, non explosive and non-combustible. C of $Na_2S.9H_2O$ separates out from the concentrated so loses most of the water below 100°C, but one mole o per mole of Na_2S is not lost readily. With sulphur so sulphide forms Na_2S_4, sodium tetra sulphide.

% Na_2S	Boiling Point °C
25	11
30	11
35	12
40	13
45	14
50	15
55	15
60	16
63.8	17

Production and demand:

The major producers in the organized sector are producing around 8000 tonnes per year, the productio hit by erratic power supply and power cuts. Deman rently is estimated around 12,000 tonnes per annu expected to go up to 14,000 tonnes by end of 199 present there is a sizable gap between production and d A 3 tpd unit based on sodium sulphate process requ approximate investment of 16.00 lakhs.

Risk Evaluation and Insurance

ROBERT W. ROBINSON, MA, CEng, MIChemE,
Oil and Energy Engineering Division, Sedgwick International Ltd., London U.K.

r in which the world witnessed several deva- incidents resulting in damage to expensive nsitive environment, the interruption of pro- ctivities and most distressing of all the loss . The stark statistics relating to three such dents in 1988 can be summarised as given

forgiven for thinking that 1988 was an unus- of nature, a coincidence. It was not. Both ore distant past are littered with similar stor- ieer in the risk control profession, many of e engraved on the mind. 1987, Pampa, Texas sion at a petrochemical plant caused US $184 3 fatalities and a prolonged shutdown. 1986 ld the Chernobyl nuclear reactor disaster. In worst industrial disasters ever to have occured struction of an LPG storage depot in Mexico illion with the loss of over 500 lives. To most e events on that horrific day were actually eks later by a disaster in human terms of even ons: Bhopal.

evastating collection of experiences, the extra ver might think we should have learnt from and that man could look forward to a safer and more profitable future in the 1990s.

However, engineers sitting in 1979 had the benefit of learning from the catastrophies which struck during the 1970's at:

Seveso, Italy July, 1976.	Description:	Release of highly toxic gas (dioxin) from a petrochemical plant resulting in injuries and illnesses to many inhabitants in surrounding areas.
Flixborough, U.K. June, 1974.	Description:	Failure of 20" by-pass line led to release of cyclohexane which ignited. The explosion destroyed the plant.
	Property Damage:	US $378 million (1988) basis.
	Fatalaties:	28
Umm Said, Qatar. April, 1977	Description:	Massive failure of refrigerated propane tank with subsequent ignition.
	Property Damage	US $127 million
	Fatalities:	7

Table 1

. U.S.A.	Description:	A 4 million gallon diesel oil tank ruptured and overflowed its bund into a nearby river. A massive pollution clean up operation was required.
	Property damage:	One failed tank.
	Pollution damage:	US $250 million.
, A.	Description:	Explosion and fire on a refinery catalytic cracker.
	Property damage:	US $290 million
	Fatalities:	7
n Sea, U.K.	Description:	Multiple explosions followed by loss of well control and fire.
	Property damage:	US $630 million
	Cost of well control & Redrill:	US $150 million
	Business Interruption:	US $250 million
	Fatalities:	167.

icial figures are estimates only.

---

ted at the Oil, Gas & Petrochemical Seminar at New Delhi, January 1989.

Undoubtedly we will have learnt how to avoid many of the occurrences which afflicted us in the 1980s. However, the uncomfortable conclusion is that in the 1990s and beyond, we will have further major catastrophes around the world bearing witness to our infallibility to design and operate industrial plants with 100 per cent safety. Nonetheless we will continue to design and operate inherently hazardous industrial processes in the name of progress which is demanded by our society. The associated costs can be measured in financial, environmental and human terms and these are, by default, to varying extents considered an acceptable price to pay for progress. The "acceptable" limits are continually becoming more restricted by governmental regulations and international pressures, mainly in response to growing concerns about the earth's delicate environment and the value of human life.

However, what is not "acceptable" is to ignore, or be ignorant of, the lessons learnt by ourselves and by our unfortunate predecessors. In the words of Jessie Ducommun a senior director of a major international oil company, "it should not be necessary for each generation to rediscover principles of process safety which the generation before discovered. We must learn from the experience of others rather than learn the hard way. We must pass on to the next generation a record of what we have learnt. We have a moral obligation to our employers to try and protect assets and profitability. We have a moral obligation to our fellow men to try and protect each other and our environment. So how do we do it?

The first dimension of risk control which needs to be considered in developing an industrial operation is the relationship between the probability of a given incident occurring and the extent of the consequences should that incident occur. In many situations, the level of risk can be quantified in terms of the product of the probability and the consequence of an event. This derived parameter can then be used as a guideline to assess the "acceptability" of a given loss scenario. If a particular scenario is then assessed as being an unacceptable level of risk, then some change needs making in the situation.

These changes to reduce the risk frequently involve additional investment or operating costs, (although the risks can often be circumvented by ingenuity or use of new technology). An industrial operation is then faced with the problem of balancing its financial resources against the level of risk acceptability. Decisions to reduce investment costs and increase the level of risk, are often made ignorant of other increased costs, such as retroactive governmental requirement and insurance premiums, which may be a burden to the project at a later date.

Difficulties arise in trying to assess risk event probabilities and consequences, and this is wh
and data bank of worldwide loss inci
relating theoretical predictions with a
ience. For every major disaster which
smaller incidents which do not receiv
Nontheless, these incidents are often p
concerned. They also contain many im
operators of industrial installations ar
an incident happens to a major mult
results of the incident inquiry may be p
ious locations of that organisation and
sort of global publicity. But in many c
immediately affected in the locality,
these losses is not generally well pub

There is however one particular cent
of information. This focus is provide
quently bear the cost of such incidents
ance community. An insurance broker l
in the centre of the worldwide insuranc
in a privileged position to see much
mation concerning the misfortunes of
operation of hazardous industrial oper
vided by the oil, gas and petrochemic
cularly prominent because the values
large. Using this type of loss incident da
strial operation can be reviewed and ass
tify and reduce the level of risk exposure
claim to totally eliminate risk; but wh
a fully integrated risk management pro
inate the exposure in financial terms b
the residual risk to insurers.

In assessing an industrial operation
distinct ways to control risk. The first
and construction of the installation, to
bility and extent of identified risks; or
ware" features. The second way to con
operation and management of the instal
'software" features.

The hardware features are usually fi
struction phase, although to a certain ext
ified during the operational phase but us
On the other hand, software features are
operational phase; but similarly they
structional phase in many areas.

The best time to review the hardwar
is at the initial design phase. It can ob
later stage but this almost invariably inv
often of a totally prohibitive nature if th
to remain economically viable. One majo
strial company carried out a review

road conclusions on the costs hardware at various stages of

lification cost

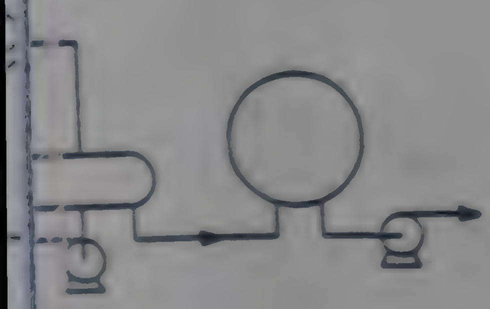
	Cost
	1
	10
	100
	1000
ter the incident	10000

his message in a package of ser- e Start''. The key element of this lient, the project contractor and le) and review the project based perience. Risk reducing measures t an early stage. This is usually in terms of the construction cost insurance cost.

view involves the identification operation such as fire, confined ur cloud explosion, BLEVE, dust lood and earthquake to name but e risk exposures, the appropriate aluated for their suitability to con- lity of an incident.

hardware parameters which has a nitude of any fire/explosion incid- mmable material. This has been loss control expert as ''what you two following diagrams illustrate tory reduction can be achieved.

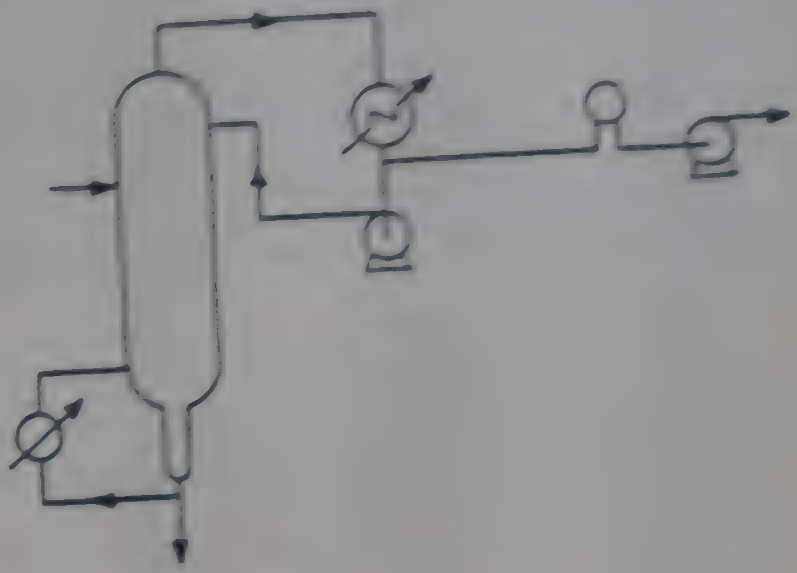
igure 1
cess design proposal



It is possible to reduce the

- column base inventory
- column tray inventory
- buffer storage inventory
- accumulator inventory

Figure 2
Revised process design proposal



Features

- Narrow section base-residence time 2 mins.
- Low inventory packing
- Refrigerant on tube side
- Accumulator removed
- Buffer storage replaced by small surge drum

If plant inventories can be rapidly isolatable in discrete sections of the plant by remotely operated isolation valves then the sources of fuel to a fire or potential fire can be reduced. Although seemingly common sensical the standards and practises used by the oil and petrochemical industry vary quite considerably. The recent Piper Alpha incident in the North Sea demonstrated quite dramatically the effect of inadequate inventory isolation capability.

Given that certain inventories of flammable materials are inevitable, engineering and construction standards need to be reviewed for suitability for the service intended, so as to minimise the possibility of a release of the inventory. However, if it is assumed that release can and does occur, and is ignited, an assessment needs to be made about the effect of the resulting thermal radiation and explosion overpressure. Various techniques are available for this and some have recently been developed into computerised models.

In limiting both the initial damage and the knock-on effects, the relative layout and spacing of process plant and equipment is often of paramount importance. This can be illustrated in Figures 3 and 4 in an example concerning two ethylene plants. It can be quickly seen therefore that the loss potential can be significantly reduced by inventory control, appropriate engineering standards and good plant layout.

This type of approach should be extended to consider the suitability of other hardware aspects such as spill control, pressure relief systems, automatic fire detection systems and fire suppression systems, to mention but a few. Other risk exposures such as toxic release also need to be considered in a similar way.

A review of the software features can in theory be carried out at any time in the lifetime of an industrial operation with some considerable benefit. The software features can be considered as the way the people manage their hardware so as to minimise the possibility and extent of a loss incident.

Figure 3
Good Layout
5 psi UVCE overpressure circle following release and ignition of a vapour cloud of 6 tonne TNT equivalence

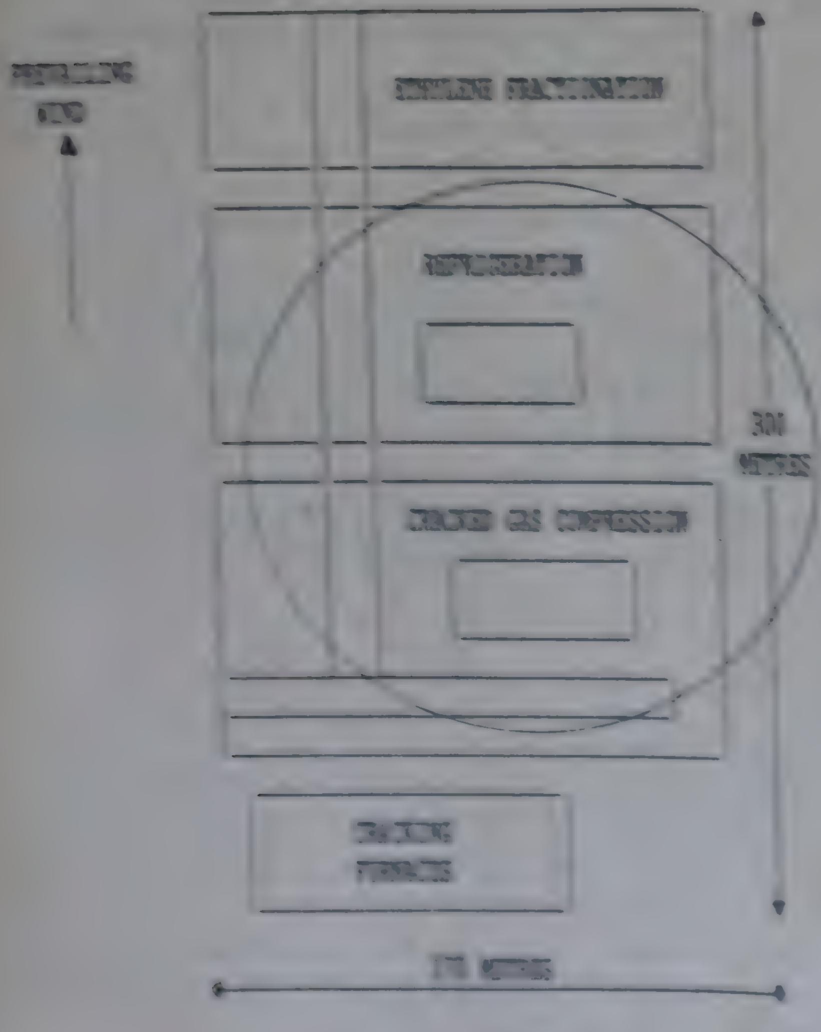
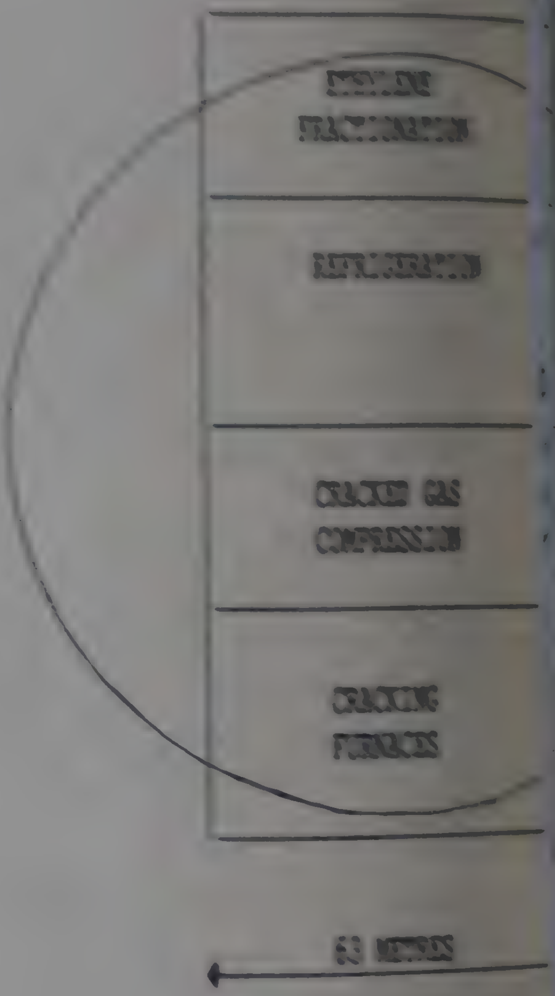

PREVAILING WIND
ETHYLENE FRACTIONATION
REFRIGERATION
CRACKED GAS COMPRESSION
CRACKING FURNACES
300 METRES
170 METRES

Figure 4
Poor Layout
5 psi UVCE overpressure circle foll
ignition of a vapour cloud of 6 tonne
- Small process plot area
- No separation between blocks


ETHYLENE FRACTIONATION
REFRIGERATION
CRACKED GAS COMPRESSION
CRACKING FURNACES
63 METRES

A review of such features typically inclu
ness of the plant maintenance department in
isation, experience, procedures and record
programme expertise and resources; the tra
ience of plant operators; the emergency pre
paredness; and the plant safety philosoph
implementation.

For each of the various software feature
produce a ranking on a numerical scale, us
all of the various software features. This
agement of an industrial operation to ident
and weaknesses in risk control as compare
isations in the world. In making such an as
software features, the inherent hazard and
need to be taken into consideration.

risk can manifest itself not only
erty, the environment and people,
errupt the profitability of an organi-
ould therefore include a thorough
nterruption exposures through the
feedstock supplier to the customer
all fire in a process control com-
otentially crippling effects on the
ding to a major business interrup-
Piper Alpha can also be seen to
ect on the revenue of the partners;
partners who had a business inter-
to cover just such an occurrence.
mical operations have historically
tention to minimising the extent of
ential, but have not thoroughly eva-
xposures and the effect on the eco-
usiness.

a review of the hardware and soft-
s is to assist the management of an
view the associated risks set against
ce of similar industrial operations.
r will realise however, that the indu-
st suggest that it is not possible to
will therefore buy insurance to cover
residual risk. In doing this the insur-
uires both qualitative and quantitative risk evaluation of the type discussed. When the insurance market is rocked by incidents of the type of Piper Alph, risk evaluation can assist in the favourable placement of insurance cover, especially for inherently high hazard industries such as the oil, gas and petrochemical.

The value of a risk evaluation to a risk manager is therefore threefold. He is able to implement improved physical and procedural measures to control the risk; he is assisted in making his decision on what is the most appropriate insurance cover to buy; and thirdly he is assisted in the purchase of the insurance by having available a full profile of his risk exposure to present to the insurance market. It is for this reason that risk evaluations and design phase advice are part of an overall package of international insurance broking and risk management activity offered by the Sedgwick Group to oil, gas and petrochemical companies, often in conjunction with local insurance companies.

In conclusion it is important to recognise that in evaluating risk, both consequence and probability need to be considered. The risk evaluation involves review of many different features which can be broadly categorised into hardware and software. A decision on the acceptability of the risk can then be made in terms of both the social and economic implications. If these decisions are made with the assistance of the truly global experience of an international oil and petrochemical insurance broker, we may then have some hope of avoiding the mistakes of the past.

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GANIC CHEMICALS

Orthophosphoric Acid

(Wet Process Based on Nitric Acid)

B.A.V.K. SHARMA
Managing Director, Sharma Consultancy Services

k phosphate with nitric acid yields
rate and phosphoric acid. Both the
gle liquid phase. The main reaction
llowing chemical equation:

$$NO_3 \dashrightarrow 10Ca(NO_3)_2 + 6H_3PO_4 + 7HF$$

exothermic and results in the evalua-
hydrofluoric acid, silicon tetrafluor-
es. The separation of soluble calcium
oric acid is not easy. Further nitric
than sulphuric acid, and also more
ic acid is required to produce phos-
e calcium nitrate has a fertiliser value
en content. Since the calcium nitrate
ure it is converted into ammonium

nt in the dissolution liquor can be par-
ystallisation at low temperatures by
s. The crystals of calcium nitrate tetra-
converted into ammonium nitrate by
and carbon dioxide. Calcium carbo-
-product.

also be converted into gypsum and
reacting with ammonium sulphate
a by-product of caprolactam process.
e converted back into ammonium sul-
pting Merseburg Process using carbon
in another method calcium nitrate is
and potassium nitrate by reacting with

on can also be used to separate cal-
od similar to the use of solvent extrac-
um chloride from phosphoric acid in
ombination process involving removal
um nitrate by crystallisation followed
with solvents like normal-butyl alco-
ketone to separate the remaining cal-
roposed.

[illegible] by St. Paul Ammonia Products of

U.S.A. involves the cooling and crystallisation of calcium nitrate tetrahydrate from the dissolution liquor thereby removing 95% of calcium nitrate, precipitation and removal of residual calcium by sulphuric acid as calcium sulphate and distillation to remove nitric acid. The cost of making phosphoric acid by this method, based on credit for ammonium nitrate is considerably cheaper than the usual dihydrate process.

Manufacture

The basic process to manufacture phosphoric acid from nitric acid acidulation of rock phosphate by adopting St. Paul Ammonia Products process consists of the following three stages:

1. Digestion of rock phosphate with nitric acid to get calcium nitrate and phosphoric acid. Removal of fluorine compounds from the dissolution liquor.
2. Removal of calcium nitrate by crystallisation. Removal of residual calcium by sulphuric acid treatment.
3. Removal of nitric acid by distillation.

The block flow diagram of the process detailing the various stages of reaction is shown in next page.

Digestion

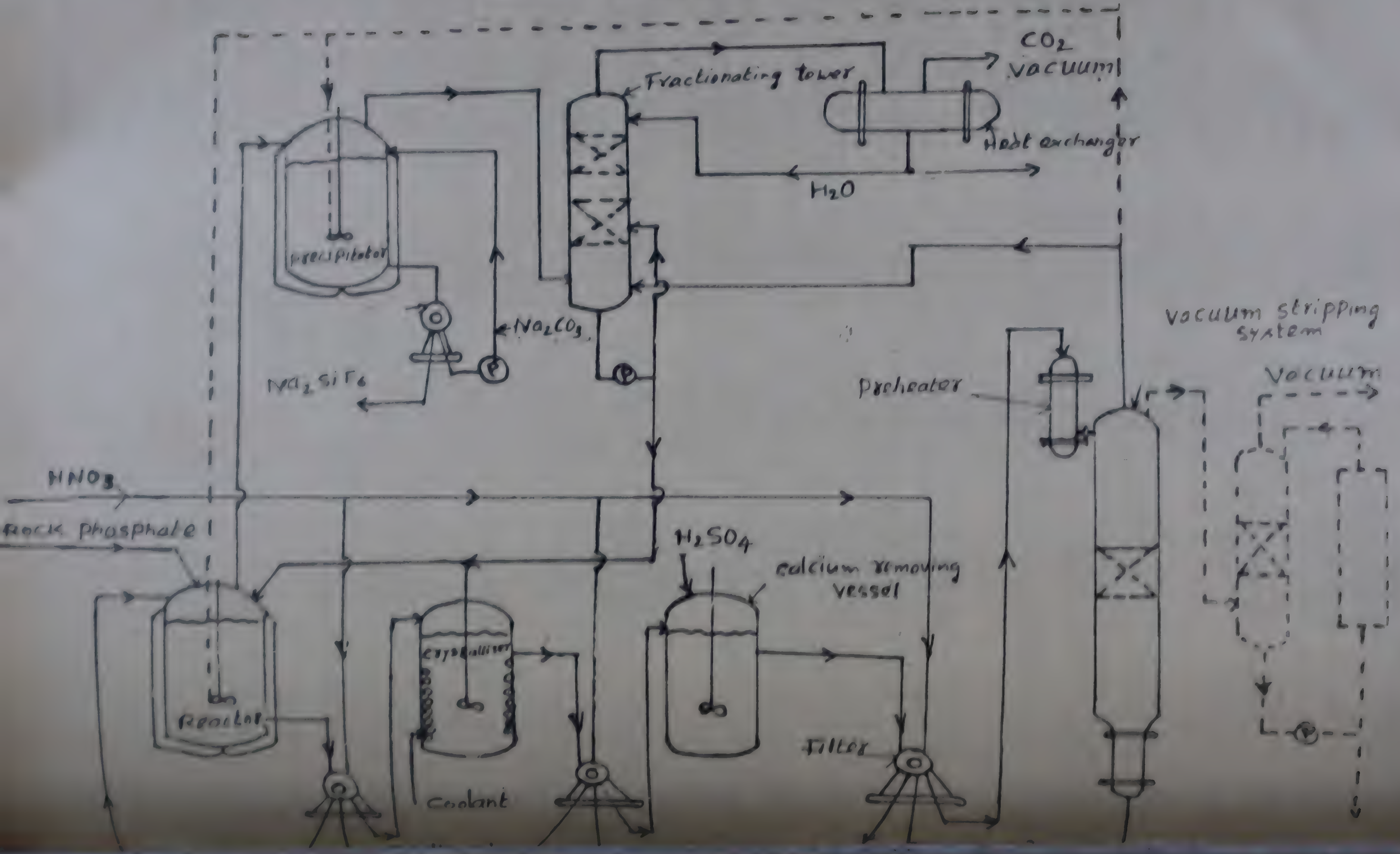
A florida rock phosphate which analysed as follows was used as the starting material.

Analysis of florida rock phosphate

Characteristics	Percent
P_2O_5	34.6
CaO	49.6
Fe_2O_3	0.9
Al_2O_3	1.0
F	3.9
SiO_2	4.4
Insolubles	4.5

The 2,205 parts of the above rock phosphate of particle size 98 per cent greater than 1.5 mm was acidulated with 5,962 parts of 52% nitric acid in a reactor. 464 parts of nitric acid of 66% concentration from the recovery cycle was also added. The amount of nitric acid added represents 25% excess of nitric acid over the stoichiometric requirement to convert all the calcium in the rock phosphate into calcium nitrate. The reaction was [illegible] and foaming was controlled by

Manufacture of phosphoric acid using nitric acid


Fractionating tower
CO2
Vacuum
Heat exchanger
H2O
precipitator
Na2CO3
Na2SiF6
Vacuum stripping system
Vacuum
Preheater
HNO3
Rock phosphate
H2SO4
Calcium removing vessel
Reactor
Crystallizer
Coolant
Filter

e nitric acid used was preheated to e of the reaction mixture between the removal of fluorine impurities as added to the reactor. Under these parts of nitric acid vapour was taken t carrying with it about 84% of the ock in the form of hydrofluoric acid , leaving about 0.18% fluorine in the

e reactor taken to a precipitator was cess sodium ion, present as $NaNO_3$ s of sodium to form Na_2SiF_6), and of sodium hexafluorosilicate as a pre- s of sodium carbonate was added to ns which had been removed from the ation as per the following reactions.

F ----▸ $Na_2SiF_6 + 2HNO_3$
--▸ $2NaNO_3 + CO_2 + H_2O$

acid of 66% concentration free from turned to the reactor.

mixture was allowed to stand for a short me settled leaving a clear liquid on the ime were separated and washed with ric acid and this wash acid was returned ctor together with 50 parts rinse water. liquor was then taken to the crystalliser ing to form calcium nitrate tetrahydrate was done for two hours at 5°F. The crys- ciently large in size were separated by n nitrate tetrahydrate removed from the nts for 95% of the lime removed from

other liquor amounting to about 2,392 alcium nitrate which did not crystallise, h 100 parts concentrated sulphuric acid on vessel. 122 parts of calcium sulphate d separated; the precipitate being washed acid and 30% rinse water, and the rinse acid was then introduced into the acid- resulting mother liquor was a clear liquid nately 1,000 parts orthophosphoric acid, d and 11 parts fluorine probably in the $_6$ and SiF_4.

en

ric acid the above liquor was introduced cid stripper with the temperature of the ing 133°F and at the bottom 320°F at a pressure of 50 mm of Hg. The tower was filled with inert packaging and the vapour generated in the liquor was distilled off as 1,370 parts of a nitric acid — water vapour containing 44.8% nitric acid as HNO_3, leaving a residue of 1,084 parts of phosphoric acid containing 63.4% P_2O_5 with only 0.04% HNO_3 and 0.1% F remaining.

The vapour was then contacted in the condenser with chilled nitric acid and the HNO_3 condensate returned to the acidulation reactor.

The nitrate can also be removed from the liquor by the use of a barium compound as a nitrate precipitating agent. The principle of barium nitrate precipitation is that the solubility of barium nitrate in water at 212°F is about 26%, this solubility is greatly lessened in phosphoric acid and further decreases with decreasing temperatures. The bulk of the barium nitrate precipitates from the liquor at a temperature ranging between 59-95°F leaving a barium nitrate concentration in the liquor of a maximum of possibly 3 to 5% based on a phosphoric acid liquor having about 40 parts by weight phosphoric acid for each 60 parts water. The barium nitrate concentration in the liquor is reduced to less than 1% (based on a 40 wt. % phosphoric acid liquor) by chilling the mother liquor to a temperature range of about 32°F to 14°F.

The barium nitrate obtained in the above process is reconverted into barium carbonate by reacting with ammonia and carbon dioxide as per the following reaction.

$Ba(NO_3)_2 + (NH_4)_2CO_3 \dashrightarrow BaCO_3 + 2NH_4NO_3$

Pollution

The emission of fluorine compounds and nitrogen oxides during acidulation of rock phosphate and boiling of mother liquor creates pollution problems.

The by-product in this process is calcium carbonate and the quantity produced is less than that of gypsum produced in the dihydrate process. The calcium carbonate produced is about 2.5 tons against 5 tons of gypsum per every ton of P_2O_5 produced. This is due to the fact that the molecular weight of calcium carbonate is much lower than that of gypsum. Further the solubility of calcium carbonate is only one-thousandth of that of gypsum, the calcium carbonate is much easier to dispose of from an environmental point of view. Another advantage of calcium carbonate is that it is substantially used in the manufacture of prilled ammonium nitrate. Calcium carbonate can be used as agricultural lime to neutralise acidic soils, as feedstock for the cement industry, etc.

Conclusion

The economics of the wet process to manufacture phosphoric acid by nitric acid is independent of the sulphur prices.

The cost of production of phosphoric acid by nitric acid route is about 20% cheaper than dihydrate route.

Though nitric acid usage has many advantages the usage of sulphuric acid for the manufacture of phosphoric acid will continue to dominate. Even if the sulphur prices soar the sulphuric acid usage will continue because the sulphuric acid can be recovered for recycling from gypsum.

Usage of hydrochloric acid for the manufacture of phosphoric acid will be restricted to produce pure acid in smaller quantities because the availability of hydrochloric acid is limited.

Ultimately the choice of the pr
factors like the lower cost of produ
raw materials, lower cost of plan
yields, lower pollution problems a
technology.

In places where sulphur is not av
acid for the manufacture of phosp
phate fertiliser assumes importanc

CORRIGEND

In the article published in 21s
the last but one para read '204
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se as an environmentally friendlier bleach than chlorine, because it breaks down into water and oxygen leaving no toxic byproducts, hydrogen peroxide can be used in industrial and municipal water treatment, for etching by the electronics industry and as a key oxygen donor in organic syntheses.

Although details have yet to be hammered out, the two firms are confident that they will be announcing other collaborations. "We are currently investigating the possibility of working together in the fine chemicals field," a company source said.

BP MOVES AHEAD WITH ACN PLANT

BP Chemicals new acetonitrile (ACN) purification unit is expected to start production during the second half of 1991.

Design and engineering work on the facility is nearing completion, although, as yet, the company has not contracted out the construction of the plant.

The unit will be located at the company's acrylonitrile plant at Green Lake, Texas, and will utilize BP's proprietary purification technology.

BP Chemicals currently operates two similar facilities at Grangemouth, Scotland, and Lima, Ohio, which have a combined capacity of 5 to 6,000 ton/year.

The addition to the Green Lake facility, with a capacity of 7,300 ton/year will more than double the company's production.

BP Chemicals' President John N. Turnbull said "Strong worldwide demand growth in recent years has led to a shortfall in acetonitrile. This investment is consistent with the company's philosophy of supporting growth by building to meet demand."

However, the company does not expect the US market to absorb the Green Lake plant's production and intends to export substantial quantities to Western Europe and the Far East.

ACN is a specialty solvent applied in advanced laboratory analysis and butadiene extraction.

STATOIL FORMS METHANOL JV

Statoil and Conoco Norway, as predicted, have begun negotiations over a joint venture to construct and operate a NKr2bn ($289m) methanol plant. The two companies are initially undertaking an extensive cooperative effort to refine the technical and commercial basis for the plant.

The study is expected to be completed in the spring of 1990. If the studies are considered viable, it is expected the plant will be built on the west coast of mid-Norway.

It is estimated the plants production will be about 840,000 ton/year of methanol. This production level would require deliveries of 750m cubic metres of gas/year, explained a Statoil spokesperson.

Gas will be supplied by Conoco's Heidrun oil-gas field through a new regional pipeline from Haltenbanken to shore.

Statoil believes the venture has the capability to serve other European gas markets at a later date from the possible methanol plant location.

Meanwhile, sources say the move would secure the groups' positions as major methanol suppliers to the European market. Western Europe currently imports about half of its current methanol consumption.

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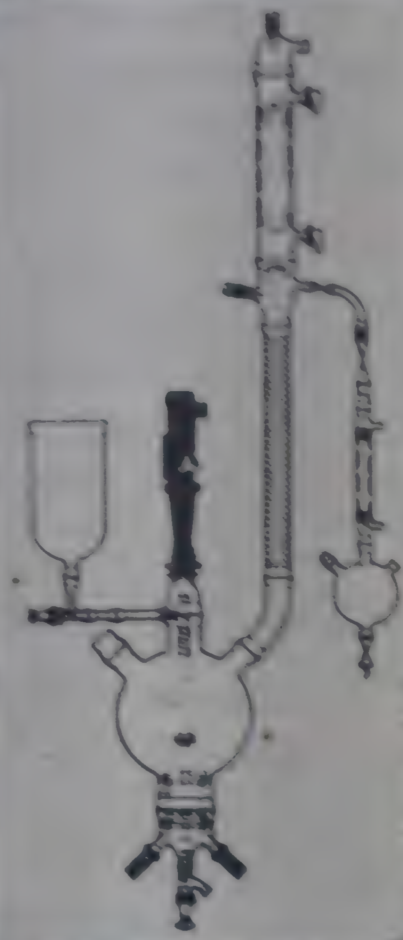

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n the waste.

agreement, Lummus
tephen Solomon said
s was "an alternative
current hazardous
waste destruction processes which are under environmental attack or do not meet regulatory standards."

Because the SCWO environment is flameless, the process will not require a hazardous waste incineration permit under the US Resource Conservation and Recovery Act.

PVC PRODUCERS PLAN MIXED PLASTICS RECYCLING GROUP

Seven top European PVC manufacturers are finalizing the legal framework for a consortium that will promote "mixed" plastics recycling -- the first large-scale initiative of its type.

The companies, which have not all been named, are set to announce the venture in the next five months. The PVC producers are leading the initiative under the auspices of the European Council of Vinyl Manufacturers (ECVM), and have invited other plastics companies to join them.

The joint venture format is still to be decided, but the ECVM suggests a European Economic Interest Group (EEIG) might be most likely. This would have the advantage of not infringing EC competition laws. The body will separate from the ECVM when established.

The aim is to develop a suitable technology for recycling mixed plastics, initially to be collected from municipal waste streams. In addition, the search for markets for the recycled products will continue. So far, the venture has taken an option on technology for a concrete substitute marketed by Wormset Kunstoffe Recycling (WKR) of Worms, West Germany.

According to the ECVM, the WKR process can mould up to 250kg in a single piece, and the company has produced park benches, anti-noise barriers for motorways and street sign supports in a small-scale operation. The other contenders produced a more limited range from recycled mixed plastics.

A spokesman from European Vinyls Corporation, one of the participating companies, said, "the manufacturers want to demonstrate mixed recycling as viable." Plastics recycling is becoming more widely available for individual products, such as PET and PVC, but few uses for recycled plastics which have not been pre-sorted have been identified.

The initiative seems likely to pre-empt legislation, proposed in most West European countries, that will force local governments to reduce their landfill use. Removing plastics from the waste stream would reduce this considerably.

CYANAMID OPENS HERBICIDE PLANT

Cyanamid's international agricultural division has opened a new 20,000 ton/-year formulation facility for its crop protection chemicals in Gravelines, northern France.

The FF150m ($23.6m) plant will use proprietary technology to manufacture water-based suspension concentrate forms of a range of herbicide products.

It will be the only plant in the world producing the liquid form of Stomp, the company's herbicide to control grasses and broadleaf weeds in major crops.

Other products include Assert and avenge herbicides, for pre- and post emergence control, respectively, of wild oats in wheat and barley, as well as various combination products.

Speaking at the inauguration ceremony, Cyanamid's Chairman and ceo George Sella said the new plant would enable the company to meet its projected European market needs for liquid formulations into the 21st century.

IDEMITSU DEVELOPS C5 RESIN PRODUCTS

Japan's Idemitsu Petrochemical is understood to be close to commercializing high value added products based on its C5 petroleum-resin technology.

The company has developed technology to produce a range of transparent grade hydrogenated petroleum resins aimed at the expanding market for hot-melt adhesives, such as those used in disposable diapers.

The company is expected to begin commercial production from a 5,000 ton/year plant at Tokuyama and establish proprietory brands over the next 12 months.

The company is also understood to be commercializing acrylic acid, acrylic esters and bisphenol A, and building up its operations for oligomer chemicals.

GE LICENSES ENIMONT POLYCARB KNOW-HOW

Enichem Synthesis, the fine chemicals arm of Italy's recently formed Enimont group, has signed an agreement to license its proprietary technologies for dimethyl and diphenylcarbonate production to GE Plastics, the world leader in polycarbonate production.

Enimont's dimethylcarbonate process is based on direct oxidative carbonylation of methanol, claimed to represent an important breakthrough.

Enimont has operated the process at its Ravenna site since 1984, and has recently increased capacity to 8,800 ton/year.

The diphenylcarbonate process, based on transesterification of dimethylcarbonate and phenol, is also used at Ravenna.

The 4,000 ton/year
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The licence agreement
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GE Plastics manufac
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DU PONT STEPS UP DUCTOR R & D

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Under a three-year $
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They will pool resource
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and Oak Ridge
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IN GRANT FOR PROCESS

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ace Scientists at the
ney, Australia, have
S 73,000 ($58,000)
from the state of New South Wales to further their research into a promising low temperature oxidation process.

The research team, led by Professor James Beattie, is developing a novel process, called Sydox, using bleach as an oxidizing agent. It leaves inorganic salts as products and holds potential to treat a range of chlorinated hydrocarbons; insecticides such as DDT; PCBs; and hexachlorinated biphenyls (HCBs). Beattie believes the process can be scaled up to tackle the growing problem of HCBs in Australia, with a cost advantage over incineration.

Australia has no domestic incineration capacity, so either stockpiles its problem chemicals or exports them for destruction. ICI Australia's Botany Bay plant alone is reported to have 8,000 ton of HCB in store. Meanwhile, Degussa is claiming commercial success in using sodium to treat oils contaminated with PCBs and other chlorinated compounds. The method has been used to reprocess up to 8 ton/day of industrial oils at Societe des Huiles Lemahieu, near Lille, France, since October 1988.

PCB levels of 500ppm are being reduced to 2ppm, and all but 2-3 per cent of the oil is suitable for reuse. The residue is a mixture of sodium chloride and non-toxic polymers. A second similar-sized unit has recently been started up in Lyon, France, specifically to treat transformer oils. Further units are planned next year in the UK and West Germany.

Degussa claims sodium has wider application in treating industrial solvents with up to 5 per cent chloride contamination. "The process is technically possible for chloride contents up to 50 per cent, but becomes less economical because of the large amounts of sodium required", said a company spokesman. For low chloride levels, around 500ppm, costs are estimated at around DM200/ton ($108) of oil.

PROPYLENE GLYCOL USP
EPICHLOROHYDRINE
PARAFORMALDEHYDE
91 & 96%
TWEEN-80
HYFLOSUPERCELL - USA
P.E.G. 4000 & 6000
STYRENE MONOMER
ROSE CRYSTAL
ISOPROPYL CHLORO
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GLYCERINE USP
LACTOSE IP/BP
TITANIUM DIOXIDE RCR2
BUTYL CELLOSOLVE
N. BUTANOL
DIMETHYL SULPHOXIDE
METHYLENE CHLORIDE
PARA CRESYL PHENYL
ACETATE
METHYL CHLORO ACETATE
MANNITOL USP
MELAMINE
PHENOL USP
CYCLOHEXANONE
TUNG OIL – CHINESE
DIMETHYL FORMAMIDE
SOYA LECITHIN
CYANAMIC ACID
TRICHLORO ETHYLENE
PARA CRESOL
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Biotechnology

SYNERGEN BEGINS ULCER DRUG TRIALS

US biotech concern Synergen has begun evaluation of its basic fibroblast growth factor in patients with topical ulcers. The Phase II trials, to be conducted at six medical centres in the US, are designed to evaluate the efficacy of the human protein in the treatment of diabetic ulcers and venous stasis ulcers. Basic fibroblast growth factor is a potent stimulator of angiogenesis (the formation of new blood vessels). Synergen also claims it induces the multiplication of certain cell types, including fibroblasts and vascular endothelial cells, which are required for tissue repair.

The protein is being produced using recombinant DNA techniques in pilot plant facilities at Boulder, Colorado. Earlier last year, Synergen licensed European marketing rights for topical applications to Ciba-Geigy's Zyma subsidiary. Zyma will be responsible for conducting trials for product registration in Europe.

Synergen has also announced that its anti-inflammatory drug IL-1i has demonstrated therapeutic activity in animal models of rheumatoid arthritis. If the results are confirmed in anticipated clinical trials, Synergen believes the IL-1i protein could form the basis for the next generation of anti-inflammatory drugs. The IL-1i protein acts as a receptor antagonist for IL-1i, preventing intercellular signal molecules from initiating inflammatory cellular processes.

SKB TO EXPAND VACCINES PLANT

Belgium's SmithKline Biologicals, a subsidiary of SmithKline Beecham, is extensively expanding its vaccine manufacturing facilities in Rixensart, south of Brussels. But state aid from the Belgian Government of BF248.8m ($6.38m), believed to be around 4 per cent of the total, is being opposed by the EC Commission.

The expansion plans are twofold. They include new manufacturing, warehousing and distribution facilities to meet a growing demand for Engerix-B, the company's genetically engineered vaccine for hepatitis B. The second part of the investment will be for the production of viral vaccines derived from mammalian cells.

Meanwhile, the Commission has opened a procedure against the finance proposal, saying that it is "outside the usual rules for state aid" and "threatens to distort competition." Under the EC framework, state aid can usually only be made available for full scale manufacturing facilities in designated development areas. The Belgian Government and other interested parties must submit views to the Commission shortly.

AL PLANS DRUGS UNIT

Norway's Apothekernes Laboratorium (AL) is to build a Nkr250m. ($36m) facility in Lier, south Oslo, which it claims will be the world's most automated pharmaceutical plant.

The plant is expected on-stream in mid-1991 and will replace some of the company's current production.

AL manufactures a range of about 80 generic pharmaceuticals, both ethical and otc. The prescription range includes antibiotics and tranquilizers. Otc products include vitamin and indigestion tablets.

A spokesman said the new plant will double productivity with automated manufacture, inventory and packaging of raw materials and finished products. The company aims to export 40 per cent of production.

MAJORS RACE TO DE TRANSPLANT BLOCK

Drug companies are comp the first to produce a family prevent organ transplant Researchers at Fisons, Fuji Merck, Sharp & Dohme are d an immunosuppressant base 506. Success could lead to a sh burgeoning market forecast to $2bn by 1995.

Attention has been drawn development of FK-506, follo publication of some pre research results. Trials of FK-5 anti-rejection agent, at the Unive Pittsburgh, produced results de as "astonishing" in patients w undergone major transplant su

Japan's Fujisawa Pharmaceu discovered the drug in 198 engaged in a three-year-old co tive agreement with the UK co Fisons. Both companies have co research on the drug, but Fiso focused on analogues to find p tions with fewer side-effects an ity problems.

FK-506 is a naturally oc macrolide antibiotic. It shares m the properties of cyclosporin A the only approved immunosup marketed by Sandoz as Sand Researchers claim FK-506 potency 100 times greater than the suppression of lymphocyte r and the generation of cytotoxic in animals.

It is projected that FK-506 used to treat auto-immune diseas as rheumatoid arthritis, psoriasis tis, Crohn's disease and multipl osis, in addition to use in the prev of organ transplant rejection results in Pittsburgh have encouraging. Of the 60 patients the drug following a kidney, live or pancreas transplant, a reje

cent was reported.
h up to 50 per cent
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ter and has a milder
than CsA.

aim would appear to
Sandoz, which has
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Dr. John Siekierka
Ierck is attempting to
d discover the binding
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hibition. This would
pany to develop other
s, he believes.

kesman said the com-
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ied lead products to
ved Fisons was nearing
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c about FK-506, it is
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partnership with Fujis-
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S HOECHST INSU-

administrative court in
an state of Hesse has
to stop work immed-
M70m ($37.8m) test
enetically engineered
Frankfurt. This means
that the company will have to stop operating the fermentation stage (Fermtec) and halt construction on the chemical purification stage (Chemtec) until a final decision on objections to the complex has been made by the courts. According to Hoechst, a decision is not expected "in the foreseeable future.".

The latest ruling was made in response to an objection to the state's reinstatement of permits for the complex in July 1988 but, a basis for the court's decision had not been made public. The planned three-stage human insulin complex has been the subject of dispute between Hoechst and West German opponents of genetic engineering for nearly five years. Objections by local residents, environmentalists and politicians have intermittently blocked construction and operation since 1985.

Permits to build and operate the first two stages (the final stage is test-scale production) were granted in June 1985 and October 1987 respectively, but suspended in November 1987 after new objections were filed. Particularly in view of the latest developments Hoechst continues to be "greatly concerned" about the possibility for industry exploitation of genetic engineering technology in West Germany, a spokesman said. The company will continue to supply patients with its modified pig insulin which is identical to human insulin.

IMMUNEX CLONES IL-4 RECEPTOR

Scientists at Seattle-based Immunex have announced the successful cloning, and isolation in soluble form, of the mouse Interleukin-4 (IL-4) receptor molecule. The discovery could hold promise in preventing organ rejection following transplant surgery and in treating allergies and asthma.

The IL-4 cytokine promotes the production of certain antibodies, including IgE which is involved in allergic and asthmatic reactions. IL-4 is also known to activate T-cells to kill tumour cells or infected or transplanted tissue.

Like other cytokines, IL-4 works by binding to matching receptors on the surface of immune cells. When bound, the receptor triggers a signal from the cytokine to the cell, promoting the immune response. A free-floating, or soluble, receptor can act as a decoy. It retains the ability to bind to the IL-4, but is unable to trigger the immune response, thereby suppressing the specific immune reaction.

Soluble IL-4 receptors are widely held to be produced naturally in humans as the body's way of turning off an immune response. The Immunex scientists now suggest the cloned receptors might be of use in eliminating a variety of disease-causing auto-immune responses.

"One of the problems with current treatment for counteracting auto-immune or inflammatory diseases is that immunosuppressive drugs are too general and can over suppress or damage a patient's immune system," says Immunex chairman and ceo Stephen Duzan.

European marketing rights to the receptor have been granted to Hoechst subsidiary Behringwerke. In exchange, Immunex has gained the US co-marketing rights to GM-CSF, IL-3 and other CSF products.

GENETICS INSTITUTE GAINS US PATENTS

Genetics Institute has obtained two US patents for new biotechnological products: human blood cell growth factor, Interleukin-3; and BMP-1, an agent which can induce the formation of new cartilage.

The Cambridge, Massachusetts-based company has patented the materials and methods for Interleukin-3 (IL-3) using recombinant DNA (rDNA) technology, and has licensed rights to Sandoz, which is conducting preclinical studies.

The US company claims IL-3 acts earlier in the pathway of blood cell development than other growth factors and may be used in combination with similar products such as GM-CSF. It is likely to prove valuable as a treatment for blood cell deficiencies associated with cancer treatment, bone marrow transplantation and other blood cell disorders.

The second patent covers BMP-1 type proteins and methods for treating bone and cartilage defects. Bone morpho-genetic proteins (BMPs) act by recruiting bone forming cells, initially producing cartilage which by further development and mineralization forms bone. BMP may be useful in fracture healing and treating bone loss following periodontal disease and certain cancers.

PGS UNVEILS SEEDS BREAKTHROUGH

Plant Genetic Systems (PGS) of Ghent, Belgium, recently announced what it claims is a breakthrough in hybrid seed production. The discovery could lead to the creation of new and more efficient hybrids. Working in collaboration with Profesor Robert Goldberg of the University of California at Los Angeles, the Belgium agrobiotechnology company has constructed and expressed a gene that prevents pollen development in crop plants, specifically rapeseed oil. The result is a male sterile plant, an essential component in the creation of hybrid seed. Traditional methods for instilling male sterility in plants can be costly and inefficient, claims PGS.

The scientists say they have succeeded in isolating a promoter that allows the expression of a gene exclusively during the development of a plant's anthers (the male reproductive organs).

According to Jan Leemans, research director of PGS, this anther-specific promoter has been used to express in the plant a gene conferring male sterility. Through the promoter, a protein encoded by the gene is expressed only during the critical few days when pollen would normally develop in the plant, suppressing its production. The protein then disappears after rendering the plant male sterile, allowing it to continue normal development.

Apart from the economic significance to rapeseed oil, which accounts for some 2m hectares of plantation in Europe, PGS claims the introduction of a gene in only a small part of a plant for only
a few days is "unique in gen
ering."

Further, the company cla
system is "universal", excep
Work is continuing on a wi
crops from vegetables, such
sprouts, to soya bean and

PGS has filed worldwide
plans to market the new tec
major seed companies. It is
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up on a case-by-case basis.
hybrids could be on the marke

Commenting on the deve
Michel Renard, research di
France's Institut Nationa
Recherche Agronomique, sa
only represented a major tech
breakthrough, but "gives bree
flexibility to create new hyb
ties."

In the UK, a spokesman for I
described the development a
science. "We shall be very inte
see how it compares, in practic
with several other system
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hybrids," he said. He added tha
its own system for the hybridi
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News from Japan

TION TO PUSH -CERAMICS CO- MITI

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global market. In view
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s been studying for some
time ways to bolster international co-operation in the fine-ceramics industry. Successful mediation by means of a consensus between the industry and its related organizations thus crystallized, plans to form the new association.

The association -- scheduled for initiation next spring -- will enlist the participation of JFCA, JFCC, Japan Ceramics Association, domestic universities, and national research institutions in its establishment. In addition to fostering exchanges of research findings, data and staff, the organization will hold discussions and seminars designed to contribute to world-wide fine-ceramics industrial development. Sources cite the possibility of the association joining in fine-ceramic automotive gas-turbine research currently being conducted by the U.S., West Germany and Sweden.

NISSAN MOTOR EMPLOYS NEW EQUIPMENT FOR TESTING ENGINEERING PLASTICS

Nissan Motor Co. -- one of Japan's leading car makers -- has decided to employ next spring fully automatic equipment for assessing the properties of engineering plastics to be used in automobiles. The equipment was developed by Mitsubishi Kasei Corporation. It is capable of completely automatically feeding samples to itself, measuring their thickness, assessing their strength (tensile strength, bending strength and shock resistance, etc.), removing them therefrom, and processing the data thereby obtained using a personal computer and printing it out.

Conventional testing equipment calls for employment of a worker who feeds and replaces samples and processes data. What is worse, it is not able to provide precise data. Engineering plastics will not be used in Nissan Motor's cars unless they pass the tests conducted using the equipment. Nissan Motor's decision will considerably influence other car makers with regard to their assessment of engineering plastics.

Mitsubishi Kasei expects the equipment to be employed by many more car manufacturers and plastic makers and plans to aggressively market it on the Japanese, and in addition, U.S. markets. It is possible to incorporate the equipment into existing testing systems and control several units of the equipment using a single personal computer.

"SIRIUS" NEW-TYPE HERBICIDE & VERSIONS APPEAR ON MART

Nissan Chemical Industries, Ltd. has begun marketing a series of its "Sirius" 1-shot herbicides for paddy fields. Sirius is Nissan's brand name for its new-type 1-shot herbicide exhibiting a powerful weed-killing effect with a very small amount of application. The items being marketed this time are "Sirius G" and its seven complex herbicides. The company intends to develop them to the point where their combined annual sales can reach ¥10 billion within five years.

It is believed the emergence of powerful Sirius will stir the 1-shot herbicide market in Japan where makers are already engaged in severe competition among themselves. Under a 5-year plan that started in 1989, Nissan Chemical is strengthening its involvement in the drug and agrochemical field along with the elaborate function-material field and the specialty-chemical one. Sirius is followed by "Targa" herbicide marketed for farm use in overseas countries.

The effective ingredient of Sirius is pyrazosulfuron-ethyl — a sulfonylurea compound with a pyrazol ring — developed in 1982 by Nissan Chemical. With its effective content of as little as 0.07%, Sirius can display a prominent effect against most weeds in a paddy field. It is also quite safe, has a longer application period and a longer residual effect. As Sirius itself is not effective for killing barnyard grass as are other sulfonylurea compounds, the company has marketed the series of versions containing Sirius and other-type effective ingredients.

WESTERN FIRMS, SOVIETS AGREE ON BIG PETROCHEMICAL PROJECT IN SIBERIA

A consortium of private companies in Japan, the United States and Europe has agreed to form a joint venture in the Soviet Union to build and operate from 1993 a $2.2-billion petrochemical complex in western Siberia. The agreement concerned was reached in late November last between the consortium, led by Combustion Engineering Inc. (U.S.) —and the Soviet Ministry of Chemical and Oil Refining Industries.

The joint-venture company (capital: $660 million) -- to be called Western Siberian Petrochemical Co. (WESPEC) -- will be located in Moscow and owned 85% by the Soviet side and 15% by the Western consortium. The said project calls for construction of production facilities in Tobolsk with an annual production capacity of 450,000 tons for polypropylene and 100,000 tons for styrene. Construction will be inaugurated shortly with completion scheduled for 1993.

The consortium includes Neste Oye -- a major Finnish oil refiner -- Mitsubishi Corporation and Mitsui & Co. --two major Japanese general trading firms --and a syndicate of banks led by Morgan Grenfell & Co., a British merchant bank. The two Japanese companies will undertake procurement of machinery and equipment, while Neste will be in charge of exports of the joint venture's products. The Soviet and Western sides signed an agreement on feasibility studies for the international project in December 1988. They originally worked out a $10 billion project aimed at building roughly 40 manufacturing plants for methanol, benzene, styrene monomer, polypropylene, synthetic rubber and methyl tert-butyl ether, etc. The project has, however, now been scaled down to the $2.2 billion one.

Western companies are scheduled to establish a joint-investment firm in Vienna, Austria, in which the two Japanese firms will invest two million dollars each.

PETROCHEM INDUSTRY TACKLES ENVIRONMENTAL PROBLEMS

Japan Petrochemical Industry Association has established a Forum for Environmental Problems, which is comprised of the association's two committees covering the environment/-plant location and technology, respectively.

As a first step, the new organization invited MITI officials in order to exchange related information with them. It is scheduled to collect accurate information from other industrial circles and the government and work out antipollution measures for the sake of the petrochemical industry.

The association formed the forum by combining the two committees since environmental problems are widely related to global warming, acid rain, depletion of the ozone layer, pollution in developing countries and transfer of harmful wastes over borders and exert far-reaching influence on societies and economies.

ARAKAWA CHEMICAL COMPLETES NEW FACTORY WITH 12,000 TON/YEAR CAPACITY

Arakawa Chemical Industries, Ltd., the top Japanese maker of naval store products, has recently completed 1st phase construction of its Onahama factory in Fukushima Prefecture. The new facilities will enable the company to produce 12,000 tons per year of printing inks, adhesives and various resins for paints. Total construction costs were ¥5 billion.

Arakawa had been constructing the factory since December 1988 on a 72,100 m^2 plot of land it pur
the coastal industrial site of
in order to meet growing dema
products and establish a base
users in the Kanto and Tohoku

The five-storey facility, whi
total floor space of 6,500 m^2
production lines, offers the fo
advantages: (1) computer-aided
purpose batch-processing,
small-lot and wide-variety prod
(2) substantial labor savings;
most advanced industrial wate
ment system; (4) an on-line syste
necting it with the head office an
factories; and (5) an interior ar
ment emphasizing the flow of ma
and products. An initial staff of
operate the factory.

In the near future, Arakawa wi
begin 2nd-phase construction a
Onahama site for paper-making
icals and other products.

ULTRAPURE WATER MAY GROWING MARKET AS SUB TUTE FOR CFCs

Kurita Water Industries Ltd. is
pushing on with a market survey
cerning equipment producing ultra
water as a substitute for chloroflu
hydrocarbons (CFCs) for clean
industrial parts. Substitutes for CF
are being earnestly sought through
the world because of the destruct
effects of the latter on the ozone la

In Japan, CFCs are being replac
to some extent, by isopropyl alco
(IPA) and ultrapure water for clean
semiconductor chips, but effective al
natives are not available as yet for cle
ing magnetic disks, printed cir
boards and glass lenses, etc.

Technological advances, how
have made it feasible to apply ultr
water (UW) to cleaning of the pro
for which UW has not so far been
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STANT PREPREG
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ng aircraft makers -- are
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It has long shelf life
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rature, 225°C; bending
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kg/mm² and fracture
megapascal.

S FIBER REINFOR-
ARED: MITSUI

u Chemicals, Inc. has developed long glass fiber-reinforced thermoplastic material for injection molding, dubbed "long-fiber pellets." The company, together with makers of molding equipment, has begun to exploit application fields for the new product.

The new material is produced using the unidirectional prepreg technology usually applied to production of thermoplastic composites. It has a high degree of compatibility between long glass fiber and base resin.

Conventional-type long glass fiber-reinforced molding material is produced by means of the "electric wire-covering method," in which the long glass fiber employed is covered with synthetic resin and cut into given lengths.

The advantages of the new product are:

1. It is capable of containing more than 50% (in terms of weight) of glass fiber, thereby attaining a high level of rigidity.
2. The long glass fiber contained therein helps the material itself display shock resistance more than double that of short glass fiber-reinforced material and excellent fatigue/creep properties.
3. The long glass fiber is dispersed more uniformly than is the case with conventional products, and
4. The long glass fiber and synthetic resin concerned have good surface-adhesiveness.

The company claims it is possible to raise the content ratio of long glass fiber to 70~80%. The new product is capable of markedly reducing production cost for moldings when it is employed as master batch.

The company envisions adding long glass fiber to crystalline resins (nylon and polypropylene, etc.) using the abovementioned process. Long glass fiber-reinforced polypropylene (reinforcement content: 30%) has the following physical properties: tensile strength, 1,300 kg/cm²; Izod value, 25kg/cm/cm. The company plans to apply the said technology to production of carbon fiber-reinforced material some time in the future.

FLUOROCARBON-FIBER SHEET DEVELOPED AS FILTERS, ELECTRONICS MATERIAL

Showa Industry Co. and Tomoegawa Paper Co. have jointly developed porous fluorocarbon-fiber sheet produced from polytetrafluoroethylene (PTFE). The new sheet consisting of fluorocarbon fibers having uniform diameter is 0.05 ~ 0.5mm thick.

The fiber diameter concerned can be freely controlled. The new product can be continuously used at high temperature of 260°C and can tolerate heat of 300°C for a short time. It is also capable of resisting acids, alkalis and organic solvents.

The product has such a high porous ratio (70%) that it is suitable for separation/filtration of mixed liquids. It is nonadhesive, has a low dielectric constant and contains only small amounts of impurities including metal ions. At most 0.3ppm of impurities are detached thereform using a hydrothermal extraction process.

The two companies are considering applying the new product to industrial-use filters and electronics materials. Showa Industry is scheduled to produce fluorocarbon staple and Tomoegawa will transform it into nonwoven-type thin sheet. The product will be marketed via Showa Industry.

The production capacity concerned stands at 1,000m² a month and will be scaled up to 6,000m² a month in the near future. They have already supplied the sheet in sample form to a foreign company-affiliated filter maker.

4TH GENERATION ANTIBIOTIC ENTERS CLINICAL TESTING IN JAPAN, U.K.

Clinical Tests have begun in both Japan and the U.K. on a 4th generation cephalosporin antibiotic developed by Mochida Pharmaceutical Co. of Japan. It is Mochida's first self-developed drug to go into clinical testing abroad. The drug has proved to have a wider antibacterial spectrum than other cephem antibiotics termed 4th generation ones. It is, in particular, quite effective against such Gram-negative bacteria as Pseudomonas aeruginosa and Enterobacteriaceae which are difficult to combat, in addition to many Gram-positive bacteria. It remains effective for a long time in the body and may be administered by means of one shot a day.

It also has strong effects against Pseudomonas aeruginosa having resistance to Gentamicin and Ceftazidim and is reactive to Methicillin-resistant Staphylococcus. "It's an all-round antibacterial agent," says Vice-President N. Aizawa of Mochida.

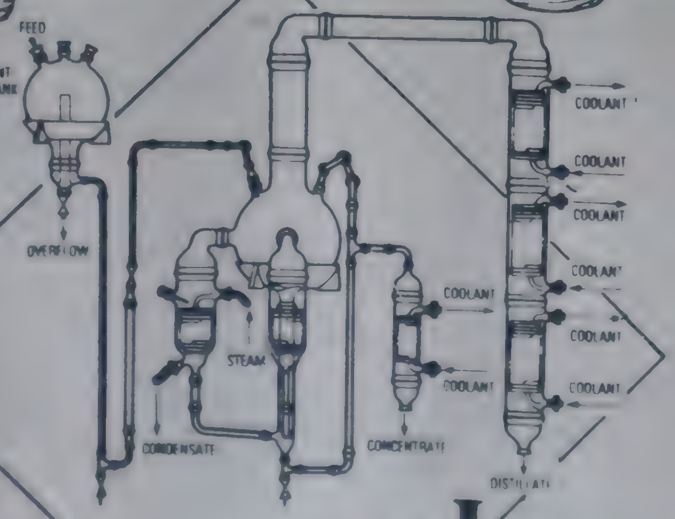
If things go as planned, the drug may be put onto the market in both Japan and the U.K. by 1994. In Japan, Ajinomoto Co. with which Mochida has teamed up for drug development has established an efficient production method for the agent and is supplying the technical-grade product to Mochida. In the U.K., Glaxo will manufacture it with Mochida's technology and undertake clinical tests ien the near future.

YOSHITOMI STARTS CLINICAL TESTS ON AMERICAN ACE INHIBITOR

Yoshitomi Pharmaceutical Co. has revealed that it has commenced clinical tests in Japan on an angiotensin converting enzyme (ACE) inhibiter supplied by Warner Lambert of the U.S. The ACE inhibiter (com quinapril) has proved to hav action than captopril, one of inhibiters so far available, an pany is intent on developi stance into an agent for t hypertension and cardiac ins

Quinapril is a new-type A iter without the SH-group valents and based tetrahydroisoquinoline. Ou it has been granted approval in UK, Governmen is awaited in the U.S., and testing is being planned in 2 tries.

It is expected, the compan one administration of the agen will be enough to stabilize b sure. It also acts to increase flow in the kidneys and the and flow of urine, the compan addition, it is said to be as sa april, another ACE inhibitor



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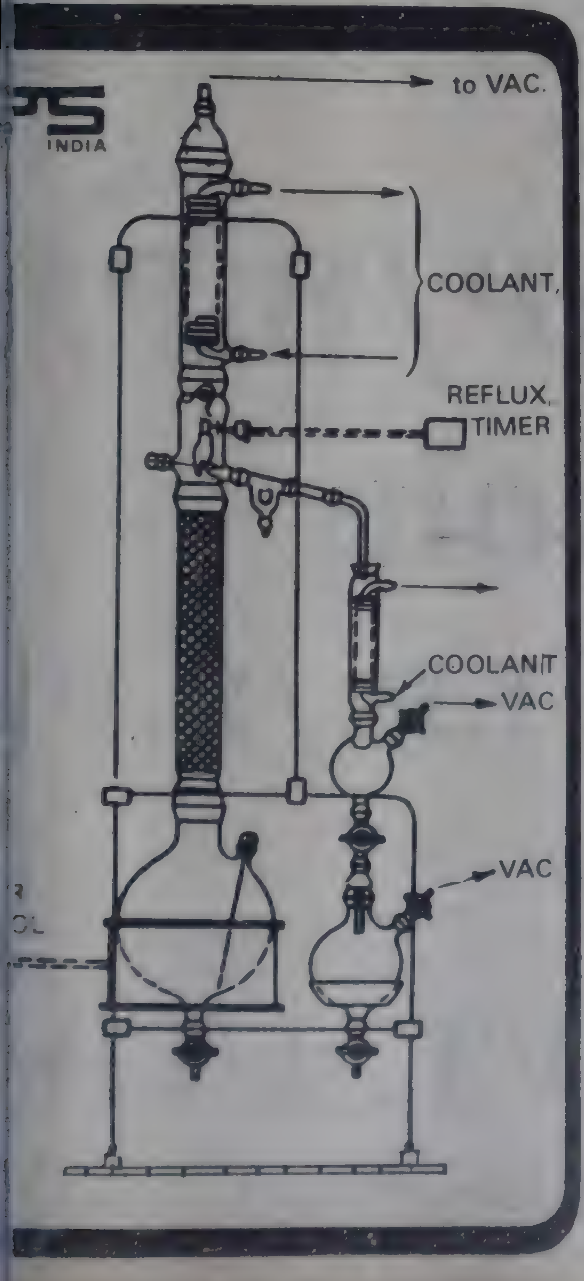

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ET INFORMATION

ward Trend In Prices

ly prevailed in
with activities
li on 9/1 follow-
bolition of octroi
ea and rangolite
each to Rs. 78
vely. Melamine
Rs. 4 to Rs. 64
gular supplies. In

the dyes intermediates section there was a mixed trend.

Increase in basic price by one manufacturer pushed up prices of some intermediates while, other intermediates came down marginally, following easy availability. Export market for dyes seemed dull for the time being.

We cannot guarantee the accuracy of the prices published in CHEMICAL WEEKLY as they are based only on the enquiries made by our correspondent – and, as such they are not FIRM PRICES as between a buyer and seller. The prices are published only with a view to giving some ideas of the market conditions.

The prices are inclusive of Excise and Maharashtra Sales Tax.

(Prices as on January 9, 1990)

ALS	Per Kg				
		Borax (Granular)	18.00	Cobalt oxide	300.00
		Borax (Powder)	22.00	Cresylic acid	62.00
		Boric acid (Tech)	26.00	Camphor (Indian)	105.00
	2.50	Bisphenol-A	76.00	Cream of Tartar (Tech.) China	70.00
Mono)	14.50	Butyl carbitol	116.00	Citric acid (Belgium) (Resale)	47.00
CH)	14.00	Caustic soda (Flakes)	11.00	Citric acid (Indian) (Resale)	47.00
	17.00	Caustic soda (Solid)	12.00	Copper sulphate	25.00
	5.50	Caustic soda (Lye)	10.00	Chromic acid	63.00
	4.50	Calcium chloride 75% (Solid)	3.25	Ethylene urea	58.00
	6.70	Calcium chloride 75-85%(fused)	3.50	Ferric chloride (Lumps)	5.50
	22.00	Calcium chloride 96%		Ferric chloride (Anhydrous)	16.00
	75.50	(Anhydrous)	5.00	Glue flakes	15.00
	5.00	Calcium carbonate (precipitated)	4.25	Glue sheets	6.75
, Oil	4.20	Calcium carbonate (Activated)	4.75	Gohsenol GH-17	110.00
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Menthol bold	665+Ex+ST
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Pentaerythritol (Resale)	45.00
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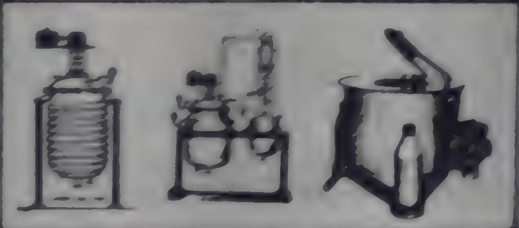

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O.A.P. 4 S.A./N.A.P. 6 S.A.
P.A.A.B./P.A.A.B. 4 S.A.

Acid Red 1/73; Acid Yellow 9/17; Basic Blue 7/11/26; Solvent Blue 4

Also full range of Dyes Intermediates, Direct, Acid & Basic Dyes

Please Contact

SHYAM DYE CHEM

C/608, Mercury, Hiranandani Complex, Andheri (W), Bombay 400 058.
Phone: 6261728 Mr. Dinesh L. Thakkar

For Your Regular Requirements Of:

itrile
Chloride
ride
trile
exane
yl Formamide
yl Sulphoxide
ro Hydrine
e Dichloride
Acid – 99% & 85%
ylamine Hydrochloride

Chloroform
Iso Amyl Alcohol
Iso Butyl Alcohol
Iso Propyl Alcohol
Lithium Hydroxide
Magnesium Oxide
Malonic Acid
Methyl Cellulose 4000
Methyl Formate
Morpholine
Methyl Ethyl Ketone
Zinc Dust

N. Butyric Acid
N. Heptane
Quinoline
P.C.B.A.
Paraformaldehyde 84-85%
Perchloro Ethylene
Petroleum Ether 40-60%
Sodium Methoxide
Thiourea
Tri-Chloro Ethylene Glycol
Tertiary Butyl Alcohol

Rajendra & Company

Gopal House (2nd Floor), 7/9, Kumbharwada Cross Lane,
Veer Vithaldas Chandan Street, BOMBAY 400 003.
Phones: 321020/339968/344937 Residence: 6124644/6122149

Bombay Dyes Market

(Prices as on January 9, 1990)

ACID COLOURS	Per Kg.
Acid Violet 4BS	*190.00
Acid Maroon V	110.00
Acid Orange II	112.55
Acid Orange IIY	93.85
Acid Red A	137.00
Acid Scarlet 3R	128.35
Acid Red 3BN	*195.00
Acid Red R2R	132.00
Acid Red RS	88.00
Acid Patent Blue AS	*280.00
Acid Green V	*375.00
Acid Coomasi Blue	200.00
Acid Yellow 5GN	65.00
Acid Red PG	85.00
Acid Red GRS	78.00
Acid Black 10 BX	157.15
Acid Black BX	126.95
Acid Black Wax	135.50
Crosein Scarlet MOO	200.30
Procinil Yellow GS (ICI, UK)	265.00
Procinil Red GS (ICI, UK)	530.00
Procinil Blue RS (ICI, UK)	315.00
Procinil Scarlet G (ICI, UK)	600.00
Procinil Orange G (ICI, UK)	250.00
Procinil Rubine (ICI, UK)	550.00

* To get resale price add 6% tax

DIRECT COLOURS	Per Kg.
Yellow 3GX	114.00
Gun Yellow RCH	175.85
Fast Yellow GCH	171.50
Yellow CFG Hly. Conc.	721.00
Fast Yellow GS	126.96
Fast Yellow CHRS	116.85
Viscose Orange A	210.35
Fast Orange GR	171.50
Red	122.65
Dark Tan	98.15
Red IIR	98.15
Red 4B	217.55
Bordeaux BW	170.10
Fast Scarlet 4BS	223.50
Red 12B	220.45
Bordeaux Hly. Conc.	249.20
Cotton Red N	117.05
Brill. Fast Helio B	362.85
Brill. Fast Helio 2R	385.85
Brill. Fast Helio 2RS	177.30
Brill. Fast Helio BS	116.10
Brill. Violet Extra	181.45
Blue 2B	102.50
Blue G	220.45
Sky Blue FB	242.00
Copper Blue GR	190.25
Fast Greenish Blue GL	114.60
Developed Black BT	149.95
Blue NB-2B	348.45
Blue NB-2BG	214.70
Developed Black NB-GHB	214.70
Green B	142.75
Green NB-B	218.90
Green 2B-N	218.90
Brown MR	197.40
Brown CN	137.00
Golden Brown G	175.85
Catechin G	155.70
Omega Tan	161.45
Catechin GS	102.80
Black E Hly. Conc.	180.15
Black E Extra Hly. Conc.	180.15
Black NB-ER Hly. Conc.	290.50

DISPERSOL COLOURS	Per Kg.
Red B 3B Conc	611.50
Red B 2B Conc	797.90
Red CB Powder	1048.25
Red D2B Powder	589.85
Violet C 4R Conc.	1202.70
Blue BG Conc	580.65
Blue BN Powder	128.20
Blue D 2R Powder	588.25
Navy BT Conc	531.95
Blue B 2G Conc	577.95
Black BT Conc	319.50
Blue BR	482.40
Yellow 7GL	813.20
Yellow 5RX	269.90
Yellow 3G	473.20
Yellow	140.00
Yellow AL	167.20
Yellow Brown REL	311.70
Yellow FFL	571.40
Gold Yellow GG	320.80
Pink REL	593.00
Red REL	615.60
Red 2B	
Red FB	
Red Violet FBL	
Orange 3R	
Violet 3R	
Violet RL	
Violet 6R	
Scarlet RR	
Rubine 3B	
Rubine CB	
Blue GL	
Blue BGF	
Navy Blue RE	
Brown 3REL	
Black GEL	
Dark Brown 3B	

BASE COLOURS	Per
Fast Yellow GC	
Fast Orange GC	
Fast Scarlet R	
Fast Scarlet RC	
Fast Scarlet RCR	
Fast Scarlet G	
Fast Scarlet GN	
Fast Scarlet GG	
Fast Scarlet GGS	
Fast Red B	
Fast Red RC	
Fast Red R Flakes	
Fast Red TR	
Fast Red TR Oil	
Fast Red RL	
Fast Red KB Oil	
Fast Bordeaux GP	
Fast Garnet GBC	
Fast Violet B	
Fast Blue BB	

NAPHTHOL COLOURS	Pe
ASG	
AS	
ASSW	
ASBS	
ASBO	
ASD	
ASOL	

	369.00
	336.05
	236.00
	249.95
	2002.35
	2459.45
	143.00
	538.65
	652.60

COLOURS	Per Kg.
ow HR	207.95
H4G	145.65
w H-8GP	168.55
HE6G	214.75
4R	276.05
H7G	332.30
R	275.45
R	387.65
M4G	201.15
M8G	366.10
R	244.70
e H2R	303.80
H7B	157.95
je M2R	313.15
H8B	213.55
t H RN	245.05
H-3BP	179.80
H-F3B	243.45
nta HB	182.00
M 5B	160.05
M 8B	218.35
MB	137.10
nta MB	163.65
e H-3R	219.55
e H-7R	175.40
H 3R	333.75
H-GR	406.40
H5G	207.95
X	286.20
H 7G	213.95
H 7RX	358.15
HA	265.05
e H-3RP	595.30
quoise H 2G P	181.50
Blue H-FRD	305.80
Navy Blue H3R	333.75
Blue H 5RX	286.20
Navy Blue M3R	355.70
Brill. Blue MR	405.60
Brill. Blue M RX	214.20
Brill. Blue M-G	226.45
Blue M 4GD	369.40
Navy Blue M RB	341.85
Turquoise M-G	240.30
Brill. Blue M GX	516.25
Blue 3R Acra Powder	718.20
Dark Brown H 6R	248.45
Cobalt Oxide	285.00
Green H4BD	287.00
Green H-E4BI	169.80
Red Brown H IF	143.25
Orange Brown H 28	209.05
Brown M GRN	188.80
Black H-N	314.20

SULPHUR COLOURS	Per Kg.
Navy Blue	210.35
Green G	194.55
Black Grains Extra	72.25
Black Grains OG	73.70
Black GXE Conc.	70.85
Black GXE	57.90
Black GXR	69.40
Black Grains 800	62.80
Black EXR Grains	73.70
Black EXR Grains 800	59.35

VAT COLOURS (ICI)	Per Kg.
Yellow 5G Supra Disperse	561.85
Yellow 5G Acra Conc	818.60
Gold Orange 3G Pdr. Fine	1158.45
Brill. Orange 6R Pdr. Fine	624.35
Gold Orange 3G Supra Disp	693.85
Brill. Orange 6RX Powder	394.30
Brill. Red 3B Pdr. Fine	1214.15
Brill. Red 3B Supra Disp	867.45
Brill. Purple 3R Acra Powder	827.05
Brill. Purple 2R Hly Conc.	744.25
Brill. Purple 4R Supra Disp.	604.25
Brill. Purple 2R Acra Conc.	779.85
Blue 2R Powder Fine	675.30
Blue BC Acra Con Pdr. Fine	1013.15
Blue BC Conc. Pdr. Fine	713.65
Blue R Conc. Pdr. Fine	719.70
Blue Conc. Powder	645.80
Brill. Blue 2R Hly. Conc.	378.55
Blue RR Supra Powder	629.35
Brill. Blue 2R Supra Disp.	115.65
Dark Blue 2R Powder Fine	512.65
Blue BC Supra Disp.	419.65
Jade Green XBN Powder Fine	555.80
Jade Green XBN Acra Conc. Pdr	1026.05
Jade Green 2G Pdr. Fine	533.25
Jade Green 2G Ptg. Paste	125.40
Jade Green XBN Ptg. Paste	126.00
Jade Green 2G Supra Disp.	618.00
Olive D Pdr. Fine	563.90
Olive Green B Supra Disp.	421.70
Jade Green XBN Supra Disp. (N)	327.30
Olive OMW Powder Fine	698.55
Olive OMW Supra Disp.	538.05
Olive D Supra Disp.	361.70
Olive R Supra Disp.	470.25
Olive D. Ptg. Paste	193.00
Olive Green B Ptg. Paste	199.10
Olive Green B Acra Conc.	741.10
Olive R Acra Conc.	779.85
Brown R Pdr. Fine	869.45
Dark Brown 3R Fine	826.25
Brown G Supra Disp.	582.05
Brown 2G Supra Disp.	716.10
Brown R Supra Disp.	547.35
Brown BR Powder	867.75
Dark Brown 3R Ptg. Paste	217.15
Dark Brown 3R Supra Disp	529.60
Brown G Acra Conc.	967.95
Brown M. Powder Fine	768.80
Grey M. Supra Disp.	585.45
Blue BC Acra Conc. Pdr. Fine	762.70
Direct Black AC Supra Disp.	415.75
Direct Black AC Pdr. Fine	574.70
Direct Black CH Supra Disp.	490.45
Direct ACD Ptg. Paste	217.15

Delhi Market

DELHI: JAN. 5, (NNS) Mercury jumped sharply by Rs 300 at Rs. 11,000 per flask in the Delhi chemicals market during last week, due to acute shortage of stock in the market as well as higher advices from Bombay. In Bombay mercury hardened sharply from Rs. 10,400 to Rs. 10,700. Sodium sulphate Gwalior rayon registered a rise of Rs. 200 at Rs. 3,400 per tonne in view of hike in its prices by manufacturers. Sodium nitrite remained steady at Rs. 800/900 due to tight stock position.

Chatkolite and sufolite slumped by Rs. 2/3 at Rs. 62 and Rs. 72 per kg respectively thanks to good offerings from Bombay. Rangolite Germany moved down from Rs. 85 to Rs. 84 followed by lower advices from Bombay. It is noticeable that in the last week of Oct. 89, prices of rangolite were quoted higher at Rs. 120. Demand was negligible from industrial units induced by power crisis in the capital.

Citric acid small dropped by Rs. 100 at Rs. 2,050 per 50 kg, due to fall in consumption and lower advices from Bombay. Citric acid bold of Bombay Dyeing slipped by Rs. 25 at Rs. 2,350. As a result of improved supply, soda bicarb eased by Rs. 5 at Rs. 285/290 per 50 kg.

On reports of about 34 tonnes of imported goods arriving in the market, hydrogen peroxide eased by 50 paise at Rs. 26/26.50. Formic acid softened by Re. 1 at Rs. 24 due to increased offerings. In the absence of demand from plastic and paints units, titanium dioxide anatase and K-brand declined by Re. 1 each at Rs. 82 and Rs. 75 per kg. Titanium dioxide RCR-2 slipped by Rs. 2 at Rs. 110 in the absence of enquiries while RC-822 ruled quiet at Rs. 98 per kg. Zinc oxide nosedived by Rs. 4,000 at Rs. 42,000/48,000 per tonne in the absence of demand.

Menthol flake medium and bold slipped by Rs. 6/10 at Rs. 352, Rs. 375 and Rs. 390 per kg respectively, in the absence of enquiries by exporters. Due to acute shortage of power in the capital, mentha oil dropped by Rs. 13 at Rs. 252/272 per kg. No change was reported in dyes and colours during the week.

(DELHI MARKET RATES AS ON JANUARY 5, 1990)

Ammonia Bicarb (Per 25 Kg.)	140.00
Mercury (Per flask)	11,000.00
Soda ash (Per bag)	340/346.00
Ammonium Chloride (50 Kg.)	110/180.00
Caustic soda flakes (50 Kg.)	475.00
Citric acid (Per 50 Kg.)	2,050/2,350.00
Stable Bleaching Powder Shriram (Per 25 Kg.)	101.00
Stable Bleaching Powder KCI (Per 25 Kg.)	90.00
Stable Bleaching Powder Maruti (Per 25 Kg.)	90.00
Stable Bleaching Powder Modi (Per 25 Kg.)	92.00
Sodium Bicarbonate (50 Kg.)	285/290.00
Sodium Hydrosulphite (Per Kg.)	34.00/36.50
Rangolite (Per Kg.)	84.00
Tartaric acid (Imp) (50 Kg.)	13,700.00
Sufolite (per Kg.)	72.00
Chatkolite (per Kg.)	62.00
DMO	120.00
Boric acid Technical (Per 50 Kg.)	1,400.00
Paraffin Wax (Per 50 Kg.)	880.00
Tartaric Acid (Indian Per 15 Kg.)	4,150.00
Borax Granular (Per 50 Kg.)	835.00
Borax Crystal (Per 50 Kg.)	835.00
Sodium Nitrite (Per 50 Kg.)	800/900.00
Sodium Nitrate (Per 50 Kg.)	450.00
Camphor Thal (Per Kg.)	103.00
Camphor Powder (Per Kg.)	93.00
Menthol Bold (Per Kg.)	390.00
Menthol Medium (Per Kg.)	375.00
Menthol Flake (Per Kg.)	
Menthol Oil (Per Kg.)	
Glycerine (Per Kg.)	
Sodium Silicate (Per quinta	
Hexamine (Per Kg.)	
Acetic Acid Glacial (Per Kg	
Copper Sulphate (Per quintal)	
Formic Acid (Per Kg.)	
Formaldehyde (Per Kg.)	
Hydrogen Peroxide (Per Kg	
Calcium Carbonate (Per Tonne)	
Acid Slurry Soft (Per Kg.)	
Acid Slurry Hard (Per Kg.)	
Phosphoric Acid (Per 50 K	
Potassium Nitrate (Per quintal)	
Potassium Permanganate (Per 50 Kg.)	
Sodium Bichromate (Per 50 Kg.)	
Trisodium Phosphate (50	
Titanium Dioxide Anatase	
Titanium Dioxide RC-822	
Titanium Dioxide K-Brand	
Titanium Dioxide RCR-2	
Zinc Oxide (Per metric tonne)	
Phenol Carbolic Acid (Per	
Carbon Tetrachloride (Per	
Chloroform (Per Kg.)	
Sodium Sulphate (Per metric tonne)	
Naphthalene Balls (Per 50	
DYES & COLOURS	
Naphthol AS	
Naphthol ASG	
Naphthol ASBS	
Naphthol ASTR	
Naphthol ASOL	
Naphthol ASBO	
DIRECT DYES	
Black E. Conc	
Diazo Black B.T	
Green B	
Blue 2-B	
Blue 2-B 225% (JNR	
Sky Blue FB	
Basic Auramine	
Basic Rhodamine	
Basic Methylene Blue	
Basic Violet	
Basic Malachite Green	
Acid Orange	
Congo Red H/C	

International Bu!k Chemical Prices

Spot Prices are as on December 13, 1989

have shot up to $172- . Though demand has crude and oils prices his spurt. Ethylene supplies with major hnical problems. Pro- ined tight in supplies g quoted at $323-335 adiene demand have caused prices to plummet to $520-560/ton. Benzene prices slipped to $385-395/ton fob NWE. Toluene was also negligibly traded in with prices at around $250-260/ton fob. Paraxylene continue its downward slide with prices around $510-525/ton fob. Orthoxylene continued at its low levels around $290-295/ton fob NWE with no signs of an upswing. Strong supplies with weak- ing demand pushed xylene prices lower, with solvent quoting at $265-270/ton and virgin at 265-275/ton fob. Shortage of ready materials prompted styrene prices to firm to $740/ton cif NWE. Methanol also firmed up to $109-112/ton fob for T2 and $95-100/ton cif for T1 following low inventories.

	European Spot price range $/ton	US price range $/ton
	310-335 (cif)	463 (spot)
% basis)	323-335 (cif)	276-286 (spot)
	520-560 (fob)	573 (spot)
	385-395 (fob)	396-399 (spot)
	250-260 (fob)	237 (spot)
n)	265-275 (fob)	264-266 (spot)
nt)	265-270 (fob)	n.a.
	780-785 (T2)(fob)	694-705 (spot)
	725-740 (T1) (cif)	
	510-525 (fob)	n.a. (spot)
	290-295 (fob)	n.a. (spot)
	88-102 (cif)	n.a.
	109-112 (T2)(fob)	n.a.
	95-100 (T1)(cif)	
	172-174 (cif)	n.a.

Shipping News

VESSELS DUE IN BOMBAY FOR EXPORT LOADING

amer's me & Flag (2)	Agents (3)	Will load for (4)	Approx. sailing dt. (5)
gis Nova	F.P.C. Co.	Jeddah; P. Sudan; Hodeidah. (Carting at Timber Pond No. 1).	17/1
13 Eager (Nhava Sheva)	C.M.B.	Djibouti; Port Sudan; Jeddah; La Spezia; Valencia; Genoa; Barcelona; Marseilles; Tunis; Casablanca; Tangier; Alexandria; Piraeus; Mersin; Limassol; Felixstowe; London; Liverpool; Manchester; Birmingham; Avonmouth; Dublin and all inland destinations in U.K.; Antwerp; Rotterdam; Hamburg; Bremen; Leixoes; Lisbon; Copenhagen; Oslo; Gothenburg; Stockholm; Malmo; Aarhus; Helsinki. (Carting at Kalamboli).	[illegible]
rest Achiever (Ger)(V-205)	Merzario/	Jeddah; Hodeidah; P. Sudan; Ravenna; Ancona; Piraeus; Venice; Trieste (Carting at M.O.D. No.2).	[illegible]
	Seaspeed/	Tilbury; London; Felixstowe; Manchester; Liverpool; Avonmouth; Le Havre; Rotterdam; Hamburg; Antwerp; Bremerhaven and Scandinavian ports. (Carting at Hay Bunder No. 5).	
	L. Triest/	Jeddah; Trieste; Venice; Ravenna; Rijeka; Naples. (Carting at M-171/173 C.D.).	
	Oceanic/	P. Said; Limassol; Alexandria; Casablanca; Tripoli; Livorno; Genoa; Mersin; Iskendren; Izmir. (Carting at Wadi Bunder No. 3).	

(1)	(2)	(3)	(4)
		Killick	Jeddah; Felixstowe, London; Liverpool; Manchester, Bristol; Avonmouth; Leeds; Glasgow; Tilbury; Birmingham; Dublin; Be Rotterdam; Hamburg; Le Havre, Antwerp; Bremen; Bremerhave Fos; Valencia; Marseilles; Barcelona and Scandinavian ports. (C at M-178/180 Cotton Depot).
15/1	Olandia (Ger)	Samrat/ Hindustan/ Merzario	Felixstowe; Hamburg; Rotterdam also London; Liverpool, Leices Lisbon; Manchester; Avonmouth; Wembly, Birmingham; Lewes Le Havre, Amsterdam; Bremen; Antwerp; Copenhagen; Leeds; Aarhus; Gothenburg; Oslo, Stockholm; Helsinki; Belfast and al destinations in U.K. Benelux Germany, Italy; France, Switzerlan and Austria. (Carting at M.O.D. No. 2 for Merzario) (Carting at M.O.D. No. 1 for Samrat and Hindustan).
15/1	Medipas Wave	L. Triest	Jeddah; Barcelona, Marseilles, Genoa; Leghorn; La Spezia, Naples with TP Trieste, Venice; Ravenna; Bari; Koper; Rijeka; Las Pa Santacruz De Teneriffe, Malta; Limmassol; Alexandria; Casabla Tunis; Algiers; Lattakia; Tripoli; Benghazi; Oran; Point E Pitre Port De France. (Carting at M-171/173 Cotton Depot).
		Samrat/ Hindustan/	Barcelona; Marseilles, La Spezia; Livorno (Leghorn); Genoa; Na and other Italian ports and FCL only Beirut, Alexandria, Valen Lattakia; Mersin. (Carting at M.O.D. No. 1 for both).
		Merzario	Genoa; Leghorn; La Spezia; Naples; Salerno; Marseilles; Barcelona (Carting at M.O.D. No. 2).
17/1	Yulius Fuchik (Rus) (V-105 W/B)	Transocean	Odessa; Izmail; Reni (U.S.S.R.); Russe, Bulgaria; Budapest (Hung Linz; Vienna (Austria); Bratislava (Czechoslovakia). Deggendorf Regensborg (West Germany) (all ports on River Danube). (Cart at N/O-PD & G-PD).
16/1	Maersk Clementine	Volkart Fleming	Leghorn; Marseilles; Naples; Barcelona; Bilbao; Bordeaux; Alican Genoa; Valencia; Bremen; Jeddah; Antwerp; Rotterdam; Bremerhaven; Hamburg; U.K. and Scandinavian ports. (Carting M.O.D. No. 3).
17/1	CMB Enterprise	C.M.B.	Antwerp. (Carting at Kalamboli).
12/1	Eagle Nova	F.F.C. Co.	Colombo; Rangoon. (Carting at Timber Pond No. 1).
15/1	Medipas Wave	L. Triest	Colombo. (Carting at M-171/173 Cotton Depot).
10/1	Maribor (Yug)	Dene	Hongkong; Keelung; (Kaohsiung); Kobe; Yokohama; Tokyo; Busa (Carting at CFS Cotton Avenue for containers only)
12/1	Eagle Nova (V-06)(Cyp)	F.F.C. Co.	Penang; P. Kelang; Singapore; Bangkok; Jakarta: (T. Priok); Hong Manila; Busan; Keelung; Kaohsiung; Kobe; Yokohama; Nagoya Osaka; Tokyo; Tsingtao; Dairen; Quangzhou; Whampoa; Shang Hsingkang. (Carting at Timber Pond No. 1).
12/1	Nikolay Semashko	Transocean	Penang; Singapore; Bangkok; Main Japan Ports.
16/1	Maersk Clementine (Sing)(V-9002)	Volkart Fleming	Penang; Singapore; Hongkong; Keelung; Kaohsiung; Busan; Man Ports, Manila; Jakarta; Surabaya; Bangkok; P. Kelang; Chinese (Carting at M.O.D. No. 2).
17/1	Uni Pioneer (V-021)(Pan)	Greenways	Singapore; Penang; Port Kelang; Bangkok; Djakarta; Surabhaya; M Cebu; Kaohsiung; Keelung; Osaka; Yokohama; Kobe; Shimizu Nagoya; Pusan; Hongkong. (Carting at G/H Cotton Depot).
12/1	Eagle Nova	F.F.C. Co.	Brisbane; Fremantle; Sydney; Melbourne; Adelaide. (Carting at T No. 1)
18/1	Vega	O.S.A.	Sydney; Melbourne; Adelaide, Brisbane; Fremantle; Auckland Wellington; Lyttelton; P. Chalmers. (Carting at M-178/180 C.D
4/1	Rossana (V-39W)	Mackinnon	Muscat; Dubai. (Carting at 6-VD).
4/1	Al Zahraa (Iraq)	Al Rafidain	Umm Qasar. (Carting at 12-VD).
12/1	Sun Set	Worldlink	Dubai, Kuwait.
12/1	Eagle Nova (V-06)	F.F.C. Co.	Dubai; Sharjah; Abu Dhabi; Doha, Muscat; Dammam; Riyadh Bahrain; Kuwait. (Carting at Timber Pond No. 1).
13/1	Seacrest Achiever (V-20)	Parekh/	Muscat; Dubai; Sharjah; Abu Dhabi; Bahrain; Dammam; Kuwait; Baghdad. (Carting at Hay Bunder No. 4).
		Merzario/	Dubai; Sharjah; Abu Dhabi; Muscat; Doha; Dammam; Kuwait; B (Carting at 14-VD for Merzario)
		L. Triest	Dubai; Dammam; Riyadh; Muscat; Abu Dhabi; Doha; Kuwait; B (Carting at 171/173 Cotton Depot for L. Triest)

	(3)	(4)	(5)
	Sai Ship/ Seaspeed	Dubai; Muscat; Sharjah; Abu Dhabi. (Carting at Wadi Bunder No. 3). Dubai; Dammam, Bahrain; Kuwait, Doha. (Carting at H.B. No. 5)	
ntine	V. Fleming	Dubai, Dammam, Muscat, Bahrain; Kuwait; Riyadh; Doha (Carting at M.O.D. No. 2).	20/1
ger Sheva)	C.M.B.	Dubai; Abu Dhabi; Bahrain; Kuwait, Dammam; Doha. (Carting at Kalamboli)	
ertskiy	Sai Ship	Mombasa; Dar Es Salaam. (Carting at W.B. No. 3)	18/1
ger Sheva)	C.M.B.	Dar Es Salaam; Mombasa (Direct); Nacala; Tanga; Kampala; Blantyre; Lusaka; Ndola; Matwara, Lilongwe, and all inland destinations in East Africa. (Carting at Kalamboli)	22/1
ger Sheva)	C.M.B.	Norfolk; New York; Baltimore; Philadelphia; Charleston; Savannah; Houston; Miami; New Orleans; Via Antwerp; Montreal, Toronto; Halifax. (Carting at Kalamboli).	22/1
Achiever 5)	Seaspeed/	New York; Baltimore; Norfolk; Savannah; Charleston; Houston and S. American ports. (Carting at Hay Bunder No. 5)	19/1
	Oceanic	New York; Baltimore; Philadelphia; Chicago; Boston; Norfolk; Atlanta; Charleston; Savannah; Miami; Houston and other inland destinations in U.S. East Coast and S. American ports. (Carting at Wadi Bunder No. 3).	
s Wave	Samrat/ Hindustan/ L. Triest	Boston; New York; Baltimore; Norfolk; Charleston, P Mouth; P. Lauderdale; Miami; New Orleans; Savannah; Jacksonville; P. Everglades; Philadelphia; Halifax; Montreal; Toronto and S. American ports. (Carting at M-171/173 Cotton Depot for L. Triest) (Carting at M.O. D. No. 1 for Samrat and Hindustan).	22/1
ntine g (V-9002)	Volkart Fleming	New York; Philadelphia; Baltimore; Norfolk; Charleston; Savannah; Jacksonville; Miami; New Orleans; Houston; Toronto; Montreal; Chicago; Atlanta; Denver, Dallas; Wilmington; Milwaukee; Detroit, Mineapolis; Memphis; Nashville; Cleveland; Phoenix; Boston; Los Angeles. Vancouver; Seattle; San Francisco; Portland; Longbeach; Mexican and S. American ports. (Carting at MOD No. 2)	20/1
Nova (V-06)	F.F.C. Co.	Los Angeles (Harbour); Longbeach; San Francisco; Oakland, Seattle; Vancouver (B.C.); Portland, New York; Boston; Norfolk; Baltimore; Charleston, Savannah; Miami; New Orleans; Houston; Montreal. Toronto; Fortworth; Chicago; Nashville; Atlanta; Philadelphia; Milwaukee; Kansas City; Phoenix; Guam; Dallas; Cleveland; St. Louis; Cincinnati; Denver; Louisville; Memphis; Wilmington (B.C.); San Diego; Mineapolis; Indianapolis and Central American ports; Honolulu. (Carting at Timber Pond No. 1).	17/1
(V-09A/B)	O.S.A.	New York; Baltimore; Philadelphia; Houston; Boston; Chicago; Dallas; Atlanta; Savannah; Norfolk; Charleston, Los Angeles; San Francisco; Oakland; Seattle; Vancouver; Toronto; Montreal; Portland; Tacoma and S. American and W. Indies Ports. (Carting at M-178/180 Cotton Depot).	23/1
ager a Sheva)	C.M.B.	Lagos; Abidjan; Lome; Douala; Matadi; Port Gentil; Pointe Noire, Nouakchott; Cotonou; Dakar; Luanda; Monrovia; Tema via Antwerp (Carting at Kalamboli).	22/1
Achiever	Seaspeed	West African ports. (Carting at Hay Bunder No. 5)	19/1
Wave	L. Triest	With T.P. Lagos/Apapa; Abidjan; Dakar, Douala; Cotonou, Nouakchott; Libreville; Tema; Matadi; Conakry; Freetown. (Carting at 171/173 Cotton Depot).	21/1
ia	Merzario	Dakar; Abidjan; Monrovia; Lome; Douala; P. Noire; Matadi; Libreville; Cotonou; P. Gentil; Lagos; P. Harcourt; Warri; Freetown; Conakry; Louanda; Nouakchott; Guinea Blassa. (Carting at M.O.D. No. 2)	21/1
k mentine	V. Fleming	Lagos/Apapa; Dakar; Freetown; Monrovia; Lome; Cotonou; Douala Tema. (Carting at M.O.D. No. 2).	20/1

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17/1	CMB Enterprise (Nhava Sheva)	C.M.B.	U.K. Cont./U.S./Med./E. Africa
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23/1	Ind. Faith	I.S.S. Co.	U.K. Cont.
18/1	Ibn Al Moataz	Transworld	S. America
21/1	Jag Yamuna	I.S.S. Co.	U.K. Cont.
21/1	Jala Gopal	S.C.I.	U.S./Canada
19/1	Lanka Aruna	Seahorse	U.K. Cont.
24/1	Regine	Sai Ship	Cont./Med.
19/1	Vishva Kaumudi	S.C.I.	U.K. Cont.
20/1	Vishva Mamta	S.C.I.	Cont./Med.
18/1	Vega (V-09)	O.S.A.	Far East/U.S.
		M.S.P.L.	Far East
17/1	Yulius Fuchik (V-105)	Transocean	Russia/E. Europe

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00 Kgs., Rs. 25,431; Gopi
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Kgs., Rs. 3,81,469; Jayshri
ds., 1,000 Kgs., Rs. 25,431;
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Kgs., Rs. 25,431; Rajaswi
Mfg. Inds., 1,000 Kgs.,
; Rajaswi Polychem Inds.,
Rs. 25,431; Saichem Indus-
0 Kgs., Rs. 25,431; Venus
s, 1,000 Kgs., Rs. 25,431.

ACID: From Brazil: Anil
,000 Kgs., Rs. 1,84,986.

NIUM OXIDE: From FRG:
lustries Ltd., 250 Kgs.,
1.

INIUM OXIDE SYNTHE-
m Japan: Grindwell Norton
0 Kgs., Rs. 4,37,689.

NO 3-BROMO 5-NITRO
NITRILE: From Japan:
India Ltd., 1,600 Kgs.,
93.

ONY TRIOXIDE: From
Dr. Beck & Co., 250 Kgs.,
9.

ATIC CHEMICALS: From
nta Chemical Co., 125 Kgs.,
75; Seth Brothers Perfumers
, 70 Kgs., Rs. 56,962.

NIC TRIOXIDE: From Fin-
halakshmi Glass Works Ltd.,
14.4 Kgs., Rs. 81,298.

4-B ACID: From Japan: Colour Chem Ltd., 4,000 Kgs., Rs. 2,95,165.

BENZYL OXYPHENBUTAZONE: From UK: Pragati Chemicals, 1,200 Kgs., Rs. 5,17,217.

BON ACID: From China: Dalal Enterprises, 2,000 Kgs., Rs. 1,86,495.

1,4 BUTENE DIOL: From USA: Excel Industries Ltd., 16,394.96 Kgs., Rs. 12,21,543.

CAPROLACTAM: From Belgium: J.K. Synthetics Ltd., 4,940 Kgs., Rs. 1,51,82,915; From Brazil: Garware Nylons Ltd., 250 MTs., Rs. 71,41,923; From Netherlands: The Baroda Rayon Corpn. Ltd., 153 MTs., Rs. 46,43,231; From Spain: J.K. Synthetics Ltd., 1,875 Kgs., Rs. 5,22,525; From USA: Garware Nylons Ltd., 125 MTs., Rs. 32,84,865.

CARBON BLACK: From FRG: Garware Paints Ltd., 900 Kgs., Rs. 1,63,299; Goodlass Nerolac Paints Ltd., 3,600 Kgs., Rs. 5,87,557; Rapicut Carbides Ltd., 2,500 Kgs., Rs. 64,484; From UK: The Standard Batteries Ltd., 600 Kgs., Rs. 1,14,558; From USA: Goodyear India Ltd., 2,721.6 Kgs., Rs. 34,194.

3,3-CHLOROPROPANOLAMINE 1-N-N-DIETHYLAMINO BENZOL: From Switzerland: Sandoz India Ltd., 1,600 Kgs., Rs. 11,83,247.

CITRIC ACID MONOHYDRATE BP: From China: Gayatri Labs Pvt. Ltd., 1,800 Kgs., Rs. 3,85,175.

PARA CUMIDINE: From Japan: Hoechst India Ltd., 3,040 Kgs., Rs. 22,78,579.

2-CYANO 4-NITRO ANILINE: From China: Serene Dyestuff Inds. Ltd., 250 Kgs., Rs. 3,72,992; From Hong Kong: Nirup Synchrome Limited, 2 MTs., Rs. 8,89,945.

2-CYANOPYRAZINE 99%: From Japan: Suchem Laboratories, 800 Kgs., Rs. 4,64,164.

DICYANDIAMIDE: From FRG: Cibatul Ltd., 200 Kgs., Rs. 72,933.

DIMETHYL CARBONATE: From France: Ganesh Medicament Pvt. Ltd., 1,000 Kgs., Rs. 3,52,644.

DIMETHYL C12/C14 AMINE: From FRG: Flame Pharmaceuticals Ltd., 3,040 Kgs., Rs. 1,31,944.

DIMETHYL DICHLORO SILANE: From FRG: Cadila Laboratories Ltd., 3,000 Kgs., Rs. 1,21,407.

TERTIARY DODECYL MERCAPTAN: From USA: Synthetics and Chemicals Ltd., 13.94 MTs., Rs. 2,96,637.

EPICHLOROHYDRIN: From Japan: Excel Industries, 15.84 MTs., Rs. 4,35,657; Pragati Chemicals Pvt. Ltd., NA, Rs. 4,79,572.

GAMMA FERRIC OXIDE: From USA: Jai Electronic Inds. Pvt. Ltd., 1,000 Kgs., Rs. 45,776.

HEXAMETHYL DISILAZANE: From FRG: Gujarat Lyka Organics Ltd., 2,170 Kgs., Rs. 3,86,112.

N-HEXANE 99%: From FRG: Spectrochem Pvt. Ltd., 264 Kgs., Rs. 29,351.

HYDROFLUORIC ACID: From FRG: Bharat Heavy Electricals Ltd., NA, Rs. 52,439; From USA: Bharat Electronics Ltd., 15,968 Kgs., Rs. 5,02,096.

HYDROXY CITRONELLAL: From France: Oriental Aromatics, 1,010 Kgs., Rs. 23,117.

IODINE CRUDE: From China: Eskay Fine Chemicals, 290 Kgs., Rs. 6,35,781.

ISOBUTYL BENZENE: From UK: Concept Laboratories Pvt. Ltd., 13,680 Kgs., Rs. 7,83,208.

METHYL BETA NAPHTHYL KETONE: From Switzerland: Industrial Perfumes Ltd., 480 Kgs., Rs. 1,96,584.

METHYL DIETHANOLAMINE: From USA: TPT, 119.95 MTs., Rs. 52,45,428.

METHYL METHACRYLATE MONOMER: From Sri Lanka: Mars

Plastics & Polymers Pvt. Ltd., 16 MTs., Rs. 1,69,988.

2-NITRO 1-CHLOROBENZENE 4-SULPHONIC ACID N-METHYLAMIDE: From France: Sandoz India Limited, 1,514 Kgs., Rs. 2,27,134.

OCTOIC ACID: From FRG: Aryavart Chemicals Pvt. Ltd., 14.43 MTs., Rs. 2,45,646.

PARA NITROANILINE TECH.: From FRG: Pridor Chemicals and Extrusions Private Limited, 470 Kgs., Rs. 3,34,675.

PARAFORMALDEHYDE 91%: From Spain: Ion Exchange India Limited, 1,800 Kgs., Rs. 1,50,381.

PARAFORMALDEHYDE 91% PRILLS: From Spain: Sunidhi, 1,800 Kgs., Rs. 1,43,432.

PERCHLOROETHYLENE: From Italy: Goel Brothers, 18.48 MTs., Rs. 1,44,990.

PHENYL XYLYL ETHANE: From Japan: Hind Condensor Ltd., 4,000 Kgs., Rs. 1,35,633; Shreem Capacitors, 9,000 Kgs., Rs. 2,67,728.

POTASSIUM CARBONATE 99% GRANULES: From France: Kantilal Manilal & Co., 18,000 Kgs., Rs. 1,96,337.

PROPYLENE GLYCOL USP: From USA: M.J. Exports Ltd., 8,385 Kgs., Rs. 1,83,387.

PROXEL XL-2: From UK: BASF India Ltd., 500 MTs., Rs. 44,184.

SILICA FUMED: From Belgium: Acropolymers Pvt. Ltd., 480 Kgs., Rs. 52,725; Bombay Paints & Allied Pvt. Ltd., 600 Kgs., Rs. 54,922.

SODIUM CHLORITE: From FRG: Colour Chem Ltd., 1,150 Kgs., Rs. 37,823.

SODIUM FORMALDEHYDE SULPHOXYLATE: From China: AUM Chemical Corporation Ltd., 16 MTs., Rs. 2,64,484; From Cze vakia: Associated Brothers, 6,00 Rs. 1,11,833; From China: Commercial Corpn., 16,000 Rs. 2,71,266.

THIOUREA: From FRG: Dyestuffs Inds. Ltd., 400 Rs. 1,45,127.

TITANIUM DIOXIDE: From C Bhuta Overseas Co., 57.225 Rs. 12,12,751.

TRICHLORO ISOCYAN ACID: From Spain: Ion Exchange Ltd., 900 Kgs., Rs. 39,496.

TRIMELLITIC ANHYDRI From USA: Amines & Plasticizers 3,600 Lbs., Rs. 7,00,376.

3,4,5 TRIMETHOXY BEN DEHYDE: From Japan: Orex Ph Pvt. Ltd., 4,020 Kgs., Rs. 16,15

VANILLIN CRYSTALS: F Norway: S.M. Kelkar and Co. 5,200 Kgs., Rs. 13,65,674.

ZINC OXIDE POWDER: F USA: Elpro International Ltd., 550 Rs. 1,03,180.

PLASTIC MATERIALS IMPORTED BOMBAY

(From 28.11.89 to 29.11.89)

HDPE: From Czechoslovakia: A ciated Brothers, 12.5 MTs., 1,32,234; From Hungary: Metal Im 230 MTs., Rs. 26,51,624; Novo Im 250 MTs., Rs. 28,82,200; From Ja Jhaveri Polymers Pvt. Ltd., 50 Rs. 6,47,120; From Saudi Arabia: C fort Rubbers Inds., 17,150 Kgs. 2,23,888; Diamond Polyprints, 1 Kgs., Rs. 2,23,888; G.N. Plast 17.15 MTs., Rs. 2,23,888; Halo thetics Pvt. Ltd., 17.15 MTs 2,23,888; Jaydev Packaging, MTs., Rs. 2,23,888; Nobel Impo Ltd., 82.5 MTs., Rs. 9,44,134; Pla Industries, 51.45 MTs., Rs. 6,6 Regent Plastics, 17,150 Kgs. 2,23,888; Shreenath Dyechem

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s. 2,45,695; Silver Plas-
Ltd., 51.45 MTs.,
Texco Plant, 51.45 MTs.,
From Singapore: Futura
dia Ltd., 15.17 MTs.,
Metal Impex, 20 MTs.,
From Yugoslavia: Abhi-
MTs., Rs. 1,16,493; For-
cies, 110.4 MTs.,

m Qatar: Bright Brothers
Ts., Rs. 2,12,605.

rom Japan: The Supreme
MTs., Rs. 4,56,899; From
: Diamond Polyplast Pvt.
Ts., Rs. 5,16,126; Essge
vt. Ltd., 49.5 MTs.,
; Fusion Polymers Ltd.,
Rs. 1,81,833; HGF Lami-
MTs., Rs. 5,03,538; Kuppi
9.5 MTs., Rs. 5,28,714;
ilms Pvt. Ltd., 33 MTs.,
5; Plasto Metachem Pvt.
MTs., Rs. 7,26,790.

HYLENE: From Sweden:
lelinks Ltd., 75.125 MTs.,
45.

OPYLENE: From Austra-
tan Vacuum Glass Ltd., 16
,23,457; From Brazil: The
ills Co. Ltd., 100 MTs.,
51; From Canada: Gujarat
Ltd., 1,16,875 Kgs.,
64; From Czechoslovakia:
Brothers, 10.15 MTs., Rs. 1,43,947; From France: Cosmo Films Ltd., 4,825 Kgs., Rs. 8,04,916; From Spain: Gem Properties Pvt. Ltd., 16.5 MTs., Rs. 2,78,409; From Italy: Ami Enterprises, 1,500 Kgs., Rs. 2,11,879.

POLYSTYRENE (Expandable): From Korea: Thermo Packaging Inds., 12 MTs., Rs. 2,95,741.

POLYSTYRENE: From Korea: Godrej & Boyce Mfg. Co. Ltd., 85 MTs., Rs. 15,17,695.

POLYSTYRENE RESIN: From Korea: Nutherm Insulations, 12 MTs., Rs. 2,91,852.

PVC: From Brazil: Avon Inds., 50 MTs., Rs. 6,48,801; Bharat Pipes & Fittings Ltd., 550 MTs., Rs. 68,11,207; Bhhagirath Agro Plast P. Ltd., 50 MTs., Rs. 6,98,400; Finolex Pipes Ltd., 2,000 MTs., Rs. 2,79,74,337; International Polymers, 5,000 Kgs., Rs. 6,48,476; J.K. Leatherite Pvt. Ltd., 100 MTs., Rs. 14,52,578; Kanchan Pipes Pvt. Ltd., 100 MTs., Rs. 13,62,573.

PVC RESIN: From Brazil: Kundalia Industries, 50 MTs., Rs. 7,22,943; Mahabir Chemical Inds., 75 MTs., Rs. 9,31,451; Sanghi Leathers Pvt. Ltd., 150 MTs., Rs. 18,64,848; Universal Cables Ltd., 100 MTs., Rs. 14,85,126; From FRG: Burroughs Wellcome Ltd., 600 Kgs., Rs. 12,80,780; From Korea: Caprihans Inds. Ltd., 200 MTs., Rs. 31,55,505; Sudeep Inds., 20 MTs., Rs. 2,73,227; Uniplas India Ltd., 300 MTs., Rs. 38,29,608; From Mexico: Master Plastic Bottle Mfg. Pvt. Ltd., 49.95 MTs., Rs. 6,47,397; From Saudi Arabia: Ashish Cheme Plant Eqpt. Pvt. Ltd., 140 MTs., Rs. 17,92,349; From Yugoslavia: Caprihans India Ltd., 5,000 Kgs., Rs. 6,95,926.

PTFE RESIN: From USA: Mechanical Packaging Inds. Ltd., 10,000 Kgs., Rs. 2,36,424.

DRUG MATERIALS IMPORTED BOMBAY

(From 28.11.89 to 29.11.89)

CALCIUM D-PANTOTHENATE USP: From Japan: The Anglo French Drug Co. Ltd., 1,000 Kgs., Rs. 2,27,185.

FURAZOLIDONE NF: From Hungary: G. Amphray Laboratories, 4,000 Kgs., Rs. 5,49,314.

MANNITOL USP: From Brazil: Kushalchand & Co., 1,125 Kgs., Rs. 4,15,875.

NEOMYCIN SULPHATE BP 80: From China: Western Chemicals, 100 Kgs., Rs. 1,25,116.

NOVOLDIAMINE: From FRG: Sharvani Pharmaceuticals Ltd., 1,980 Kgs., Rs. 6,95,622.

D-PANTHENOL USP: From Japan: The Anglo French Drug Co. Ltd., 250 Kgs., Rs. 72,953.

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Alum
Lumps, Powder
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nium Chloride
onia Bicarb
hing Powder
x Crystals, Granular
m Carbonate
tic Soda Flakes
um Chloride
lid, Fused, Anhydrous)
um Carbonate Precipitate
Acid
er Sulphate

Ferric Chloride (Anhy)
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Potassium Carbonate
Sodium Sulphide
  (Flakes, Solid, Bits)

Sodium Sulphate
Sodium Bisulphite
Sodium Meta Bisulphite
Sodium Bisulphate
Sodium Acetate
  (Crystal, Anhydrous)
Sodium Hexameta Phosphate
Sodium Metasilicate
Sodium Nitrate/Nitrite
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231, Samuel Street, Vadgadi, Bombay 400 003. Tel.: 321462/343117 Grams: 'LAXNAGAR'

PHENOBARBITONE IP: From USSR: Modi Pharma Drug House, 510 Kgs., Rs. 86,323.

DYE MATERIALS IMPORTED BOMBAY

(From 28.11.89 to 29.11.89)

DISPERSE DYES: From FRG: Avni Dye Chemicals, 550 Kgs., Rs. 1,49,212.

DYE INTERMEDIATES: From Japan: Yogesh Dyestuff Products Pvt. Ltd., 400 Kgs., Rs. 93,679.

RHODAMINE 2B LIQUID: From FRG: BASF India Ltd., 420 Kgs., Rs. 54,876.

MATERIALS IMPORTED MADRAS

(From 1.12.89 to 5.12.89)

ACETIC ANHYDRIDE: From Japan: Srinivasa Agro Inds. & Drugs Pvt. Ltd., 32,000 Kgs., Rs. 4,93,997.

ACETYLENE BLACK: From Singapore: Indo National Ltd., 25,800 Kgs., Rs. 7,55,905; Union Carbide India Ltd., 7,240 Kgs., Rs. 1,91,119.

ALUMINIUM OXIDE: From FRG: Grindwell Norton Ltd., 900 Kgs., Rs. 62,750.

AMMONIUM ADIPATE: From FRG: Keltron Component Complex Ltd., 1,000 Kgs., Rs. 63,018.

AMMONIUM PENTABORATE: From FRG: Keltron Component Complex Ltd., 2,500 Kgs., Rs. 1,37,711.

PARA ANISALDEHYDE: From Japan: Cheminor Drugs Ltd., 4,050 Kgs., Rs. 5,57,884.

ANTIMONY OXIDE: From Japan: Fenner India Ltd., 10,000 Kgs., Rs. 5,04,566.

AROMATIC CHEMICALS: From France: Karnataka Soaps & Detergents, 800 Kgs., Rs. 2,03,642; Vasu Agarbathies, 355 Kgs., Rs. 74,097; Vinarom Pvt. Ltd., 50 Kgs., Rs. 17,714 Netherlands: B.V. Aswathiah & 100 Kgs., Rs. 88,147; Vasu thies, 200 Kgs., Rs. 56,587.

BENZALDEHYDE FFC From Netherlands: Malladi Pharm, 15,600 Kgs., Rs. 4,51,

CALCIUM NITRATE: Malaysia: Kemwell Intl. Pvt. Ltd. Kgs., Rs. 1,50,376.

CALCIUM SILICIDE: From erlands: Metal Powder Co. Ltd., Kgs., Rs. 10,30,364.

CARBON ACTIVATED: Netherlands: ICI India Ltd., Rs. 16,925.

4-CYANOPYRIDINE: From Veer Chemie & Aromatics, Rs. 4,17,464.

DESMODUR L-75: M.M. Co. Ltd., 1,200 Kgs., Rs. 72,49

DIBUTYL PHTHALATE: UK: Southern Capsulation Ltd., 25 Kgs., Rs. 10,290.

2,6-DIMETHYL CYCLOHEX From Switzerland: Bush Boake India Ltd., 25 Kgs., Rs. 36,490.

ETHANE: From Japan: Research Ltd., 1,080 Kgs., Rs.

HYDROXY CITRONELLAL France: Padmini Products, Rs. 1,10,219.

ISOBUTYL BENZENE: Cheminor Drugs Ltd., 81,94 Rs. 44,82,972.

LAB CHEMICALS: Astra Research Centre India, Rs. 23,242.

LACTIC ACID: From Tamilnadu Dadha Pharm., Rs. 6,29,866.

LILIAL: From Switzerland Agarbathies, 300 Kgs., Rs.

L-LYSINE MONO Korea: Oscar Feeds, Rs. 1,51,066.

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CAPTOBENZIMIDAZOLE: pan: Shriram Fibres Ltd., 2.5 s. 4,67,575.

HYL ACETOACETATE From Japan: Shri Siddhi Enterprises, 64,000 Kgs., ,042.

HYL CHLOROFORMATE: ungary: N. Arvind & Co., 2,000 s. 45,726.

HA NAPHTHOL: From Japan: ia Ltd., 2,000 Kgs., Rs. 2,32,749.

PENTYL GLYCOL: From Kopalle Pharma Chemicals Pvt. ,080 Kgs., Rs. 1,98,887.

PYLENE GLYCOL TECH.: USA: Naphtha Resin & Chemi- td., 17,200 Kgs., Rs. 3,49,552.

ICON DIOXIDE: From Hong Venlon Polyester Film Ltd., 200 Rs. 15,437.

TRA BUTYL AMMONIUM MIDE: From Italy: Cheminor Ltd., 10,000 Kgs., Rs. 14,22,210

IOUREA: From Japan: Pradeep Co., 3,000 Kgs., Rs. 1,01,637.

ANIUM DIOXIDE: From Singa- Intl. Trading Co., 20,000 Kgs., 57,262; From Switzerland: Sudha icals, 225 Kgs., Rs. 29,973; From Tushar Enterprises, 18,140 Kgs., ,49,716.

IMETHYL PHOSPHATE: From Indag Products Ltd., 14,651 Kgs., ,55,806.

5 TRIMETHOXY BENZAL- YDE: From Netherlands: Prasad gs Pvt. Ltd., 5,000 Kgs., 9,48,083.

PLASTIC MATERIALS IMPORTED MADRAS

(From 1.12.89 to 5.12.89)

DPE: From Japan: Rabbani orts, 32.2 MTs., Rs. 4,23,654; From herlands: Lalith Polysacks (P) Ltd., 17 MTs., Rs. 2,08,732; From Singapore: Asian Peroxides Ltd., 17,000 Kgs., Rs. 2,33,204; From USA: International Plastics, 13.608 MTs., Rs. 1,60,170.

POLYPROPYLENE: From Netherlands: Sri Narasimha Plastics Inds., 42 MTs., Rs. 5,25,753; From Singapore: Lakshmi Polypacks, 16 MTs., Rs. 2,27,615; Swarnarathinam Inds., 32 MTs., Rs. 4,60,550; VPS Ayyamperumal Nadar & Sons, 32,256 Kgs., Rs. 4,58,220; From USA: Chakra Circular Sacks, 17 MTs., Rs. 2,19,807.

POLYSTYRENE: From Korea: Dar International, 51 MTs., Rs. 5,58,306; Universal Polychem, 440 MTs., Rs. 37,06,733.

DYE MATERIALS IMPORTED MADRAS

(From 1.12.89 to 5.12.89)

BRILLIANT PINK R: From Hong Kong: H.I. Rafeeque Ameen & Co., 540 Kgs., Rs. 54,871.

DYES: From Hong Kong: H. Rafeeque Ameen Ltd., 2,000 Kgs. Rs. 1,01,614.

DYESTUFFS: From Spain: Namast Leather Garments, 2,100 Kgs., Rs. 4,10,438; Safique Leather, 1,00 Kgs., Rs. 4,64,846; From Switzerland: Namaste Leather Garments Ltd., 900 Kgs., Rs. 1,80,569.

SAVINYL BLACK RLS: From FRG: Farida Prime Tannery, 100 Kgs., Rs. 69,281.

DRUG MATERIALS IMPORTED MADRAS

(From 1.12.89 to 5.12.89)

HYDROXYLAMINE SULPHATE: From Japan: Eskayef Ltd., 25,000 Kgs., Rs. 6,67,965.

LACTOSE BP/USP/IP 200 MESH: From New Zealand: Medopharm 18,000 Kgs., Rs. 2,55,208.

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CONC: **NITRIC ACID (98.5%)**
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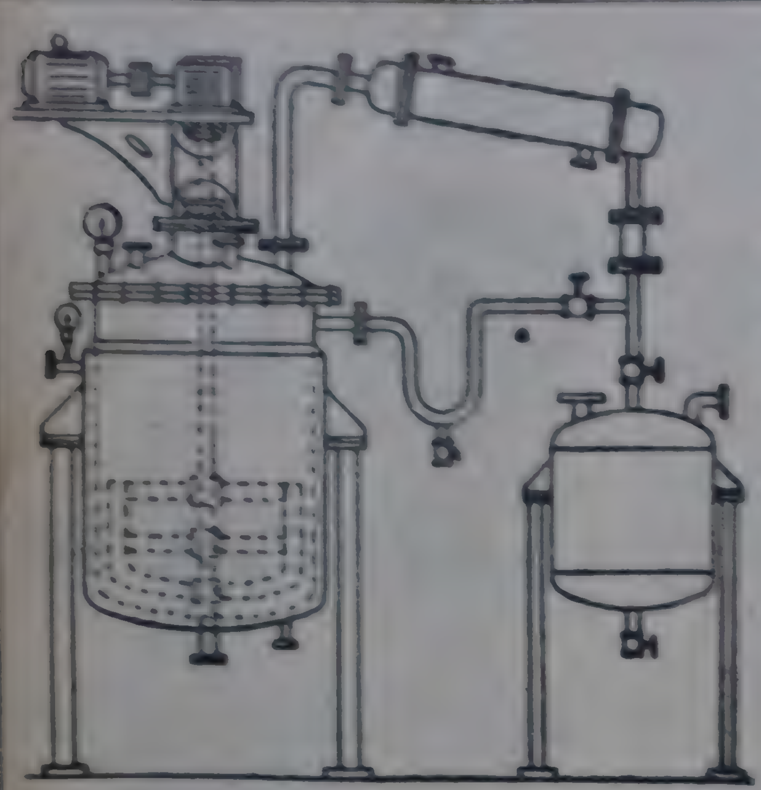

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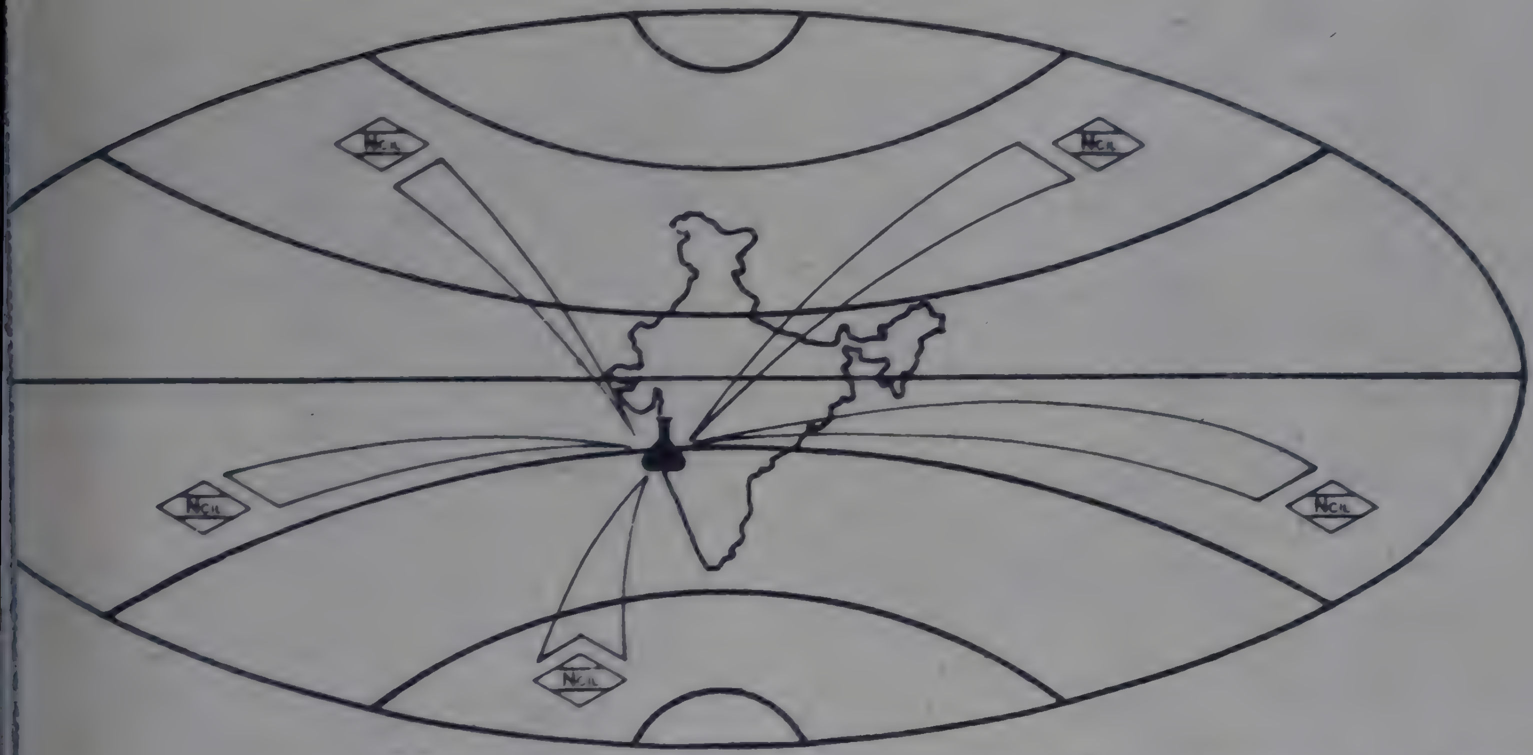

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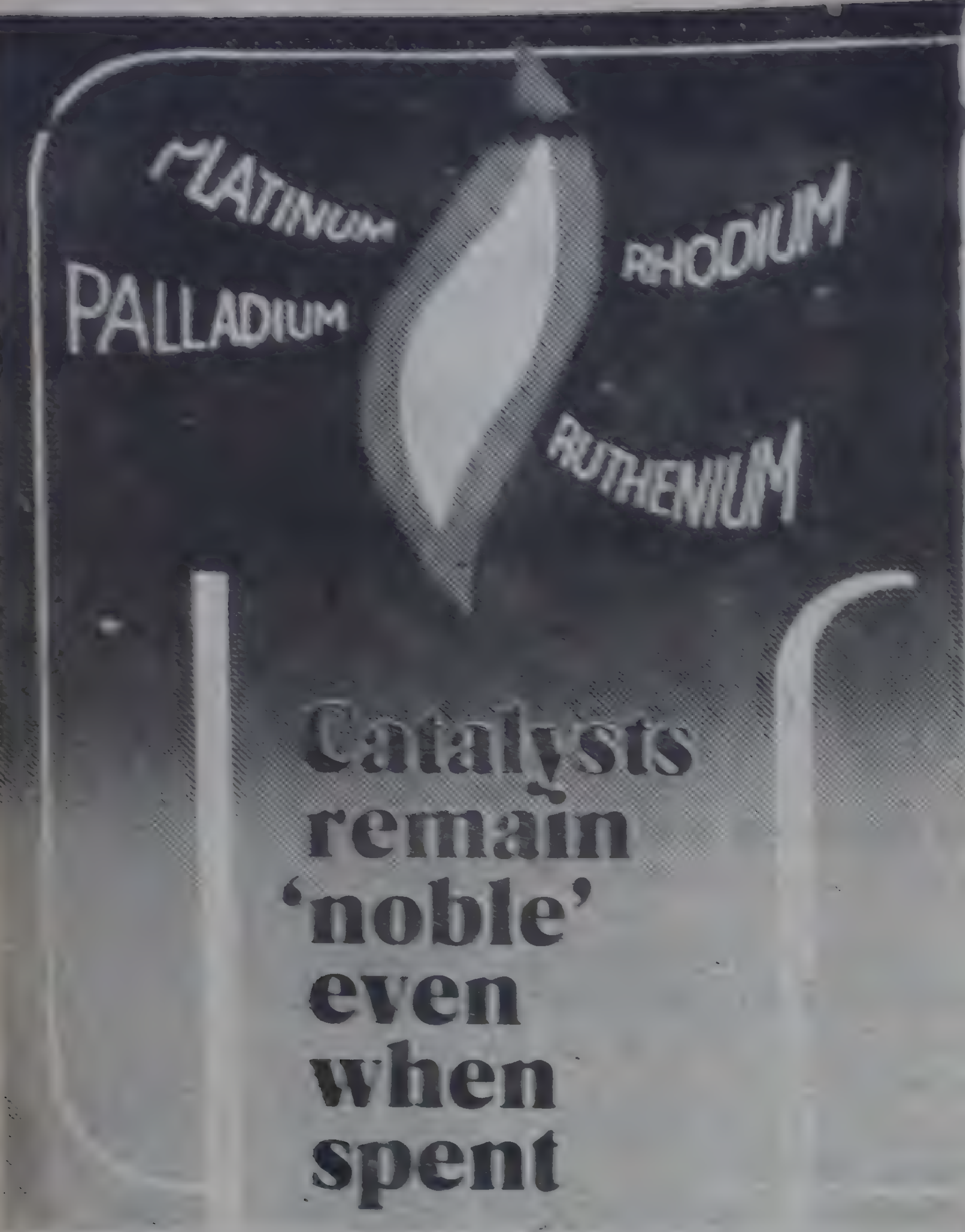

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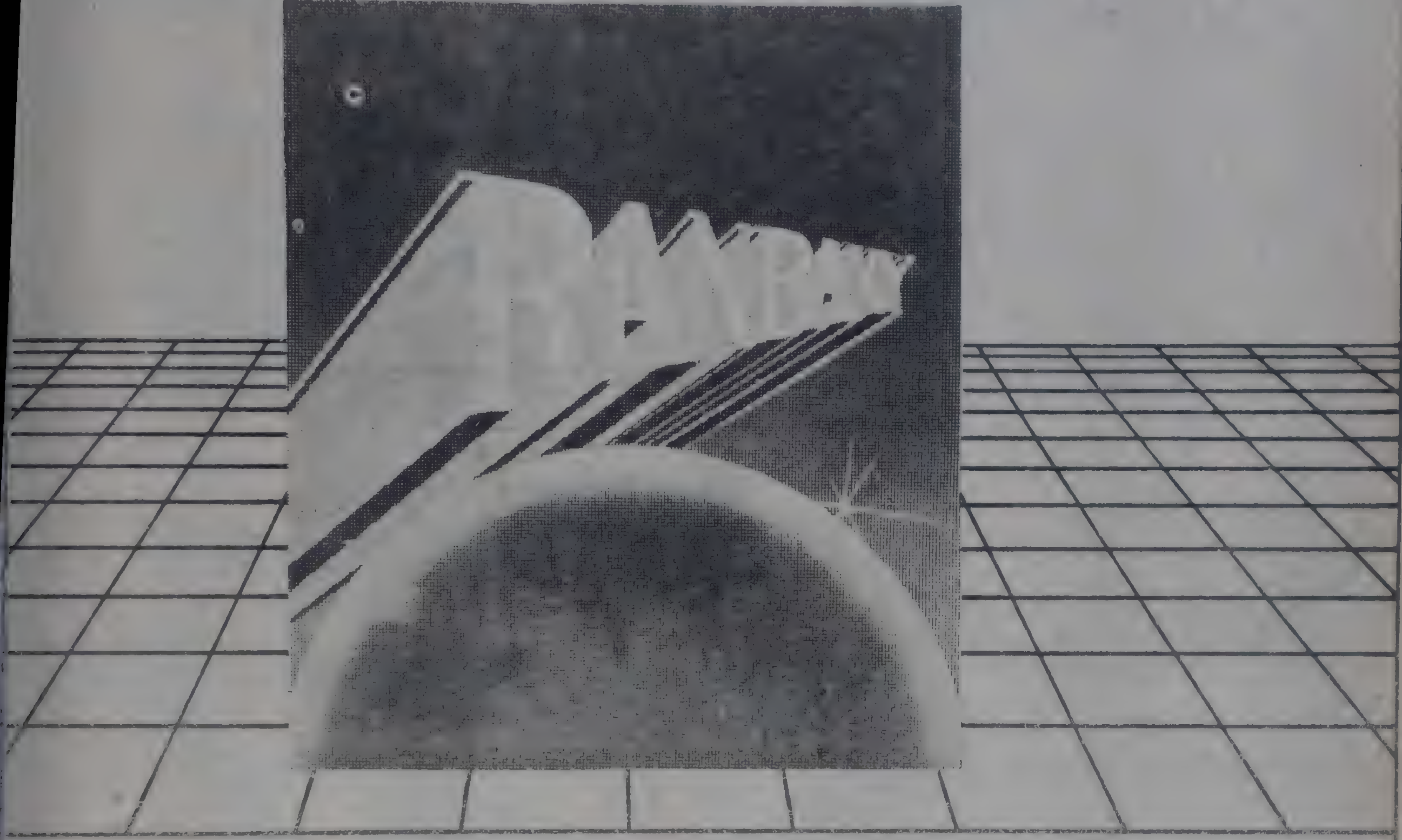

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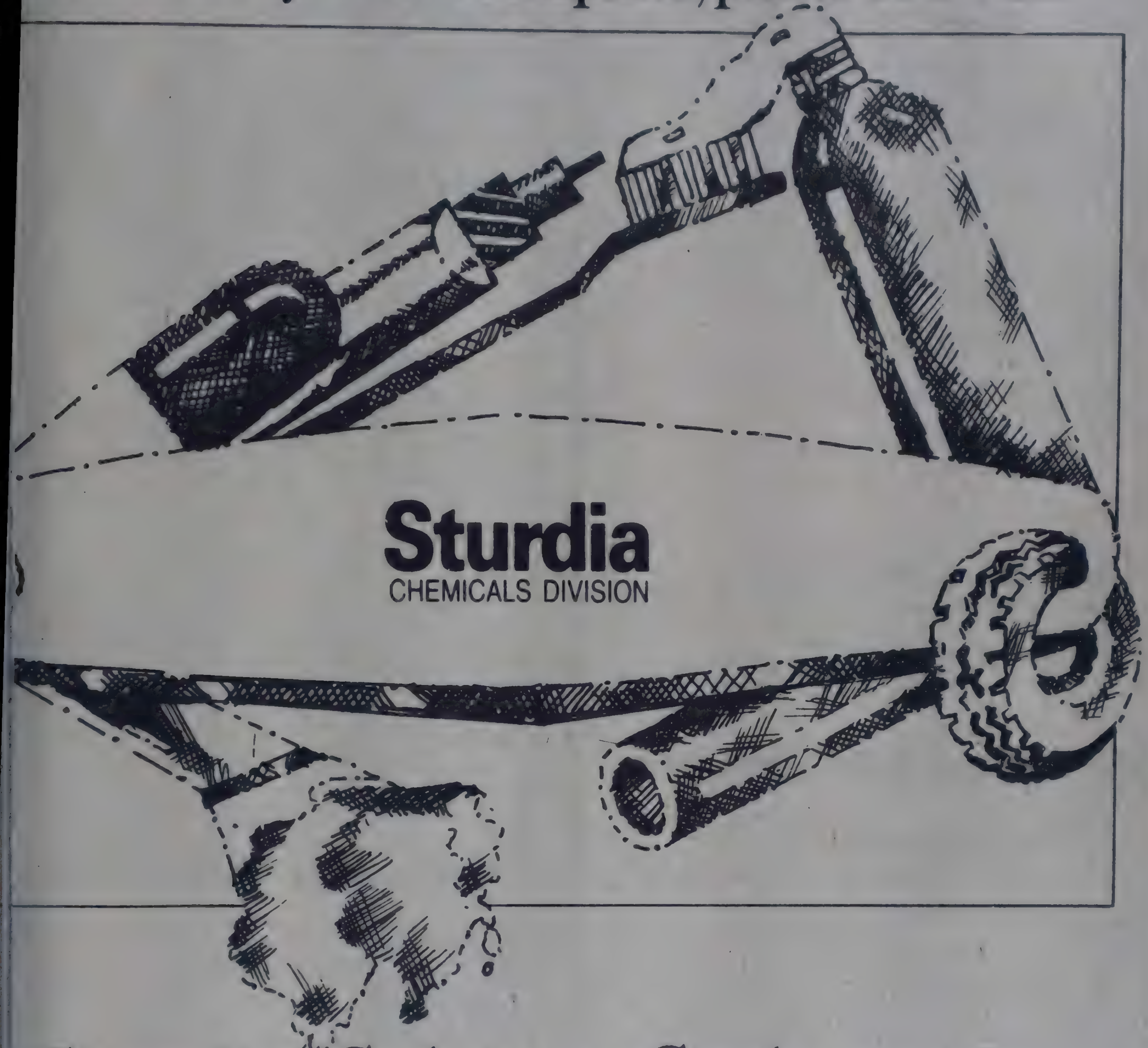

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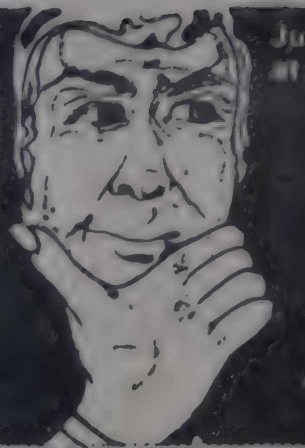

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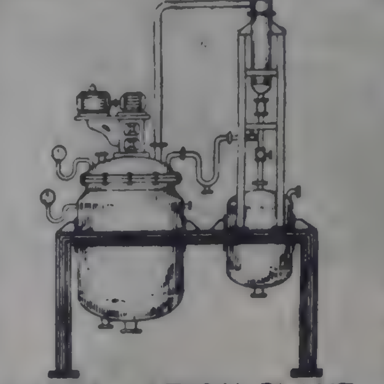

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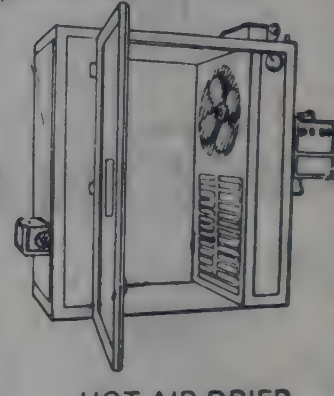

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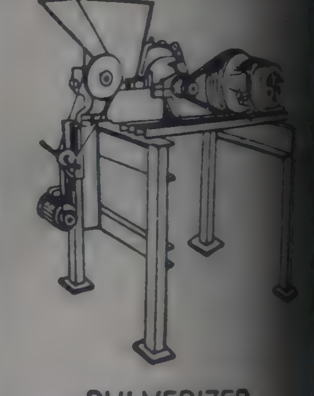

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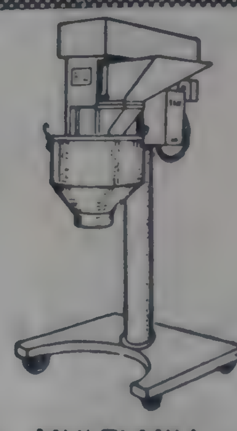

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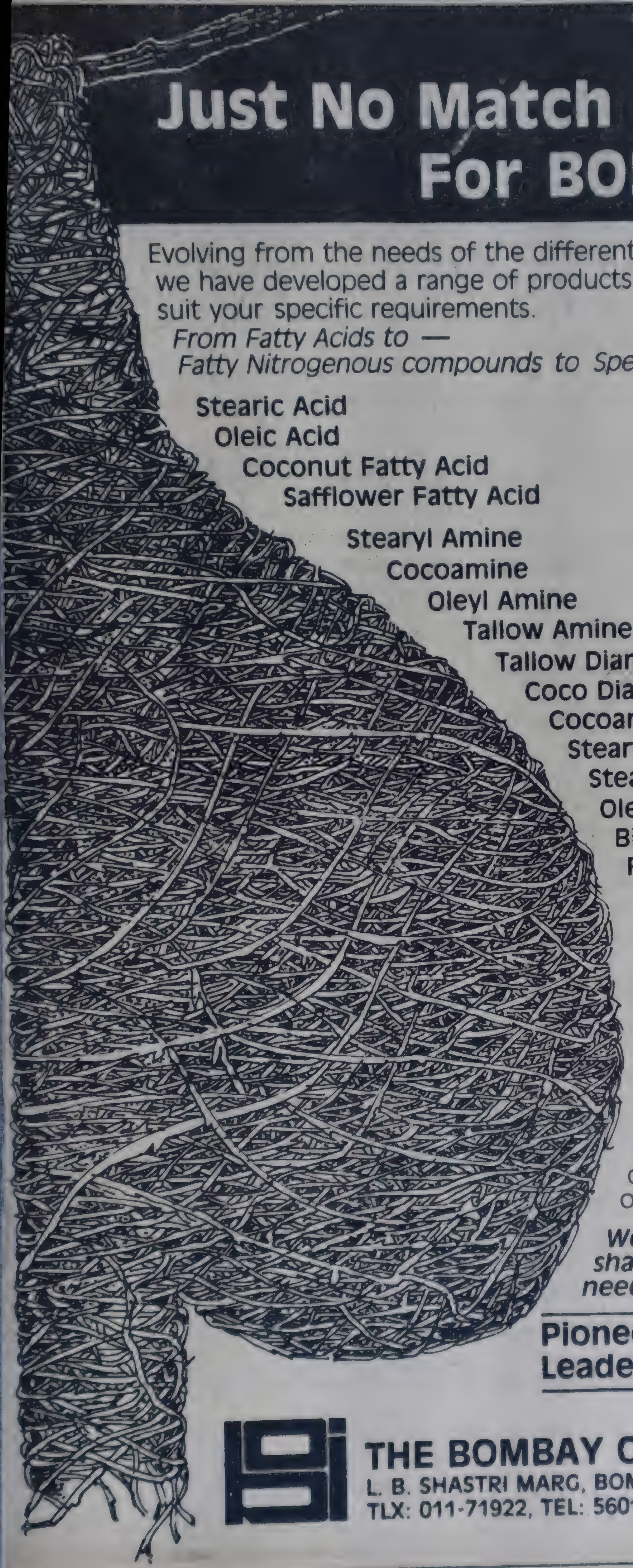

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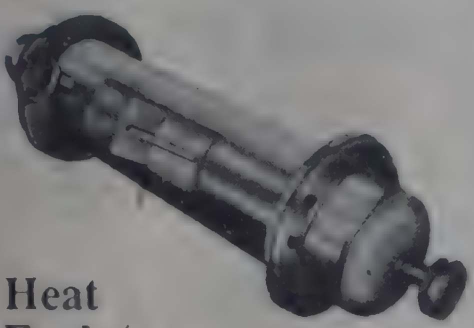

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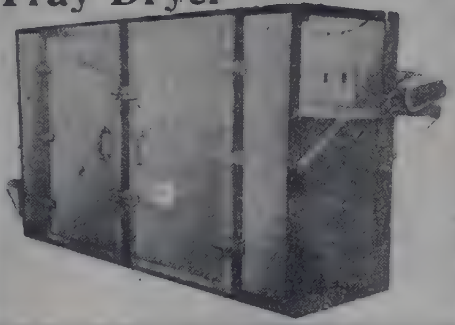

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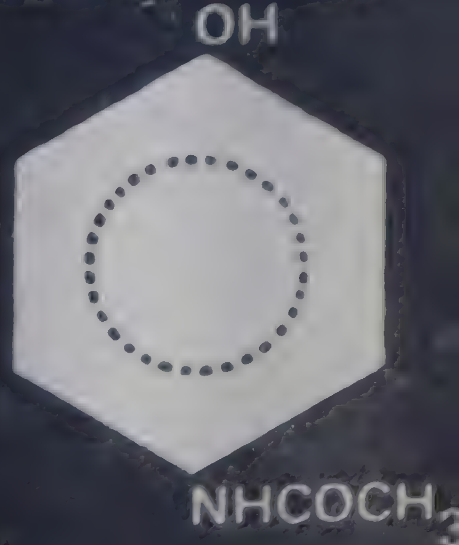

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CHEMICAL
WEEKLY

VOL. XXXV JANUARY 23, 1990 NO. 20

HERALDING THE 21st CENTURY - 35

Future of Medical Technology & Treatment

trends that are emerging in regard to new and
edical technologies are:

sive increase in knowledge about the biology of
he environment, bodily functions and new treat-

iagnosis and treatment, increasingly moving
ontrol of symptoms to interventions that will pre-
nptoms;
larger attention to the costs of health care in choi-
eatment and in development of new technologies,
in an important role for technology assessment;
capability to maintain basic bodily functions tech-
lly, when neurological control is degraded or
ntirely absent;
eration of techniques to assist, control, or avoid
ction; and
ability to evaluate, diagnose, and give medical
cal treatment to the fetus in the womb.

d More Effective Diagnosis, Intervention, and
n: Intervention in the disease process can vary from
education on diet and lifestyles, to genetic engine-
lrug therapy. The shift from controlling symptoms
sitive intervention is the result of a circular inter-
ween new scientific knowledge, new instruments,
nent enabling technologies that in turn produce
owledge. Earlier diagnosis and prevention of dis-
particular importance in approaches to chronic
which constitute the major illness burden in indu-
ations. They will, however, also affect acute ill-
which genetic, behavioural and environmental
be identified.

ion of disease itself carries a potential for clashes
he general welfare and the assertion of individual
illustrated by AIDS containment and crusades
bacco use.

re: New technologies, while causing some of this
ease in costs, also enable more people to take care
lves when ill, thus potentially reducing health care
ome based computers linked with diagnostic-
centers or implanted microchips for sensing body
s and for release of drugs, could for example make
possible self-administered chemotherapy treatment of cancer. Intravenous physical and respiratory therapy and monitoring of chronic disease could take place in the home.

A strong trend toward self-diagnosis, self-care, and home-care techniques has been evident for some time. Pregnancy test kits, kits for testing or measuring urine sugar content, and consumer instruments for monitoring blood pressure have already become familiar. Further home diagnostic tests are being developed. Implantable time-released medication is already in use for some conditions. Some experts anticipate the development of "hospitals on the wrist." i.e., wearable devices that monitor certain body functions and make chemotherapeutic and electromagnetic adjustments as necessary.

Implants of microchips and biochips may in the future allow better monitoring of bodily functions, regulate drug delivery devices, redress defective sight or hearing, and provide neural control of damaged limbs. Some scientists hope that eventually "biological machines" could be implanted to repair human tissue and organs.

Advances in biological and non-biological materials and in microelectronics hold the promise of significant advances in related technologies, such as the following:

* programmable implantable medication systems including infusion pumps, for use in treatment of such problems as diabetes and cardiovascular disease; some are now in clinical trials;
* implanted electrodes and brain peptide releasers, for treatment of depression, propensity to aggression, and other emotional disorders;
* implanted electronic hearing aids;
* cerebellar pacemakers for control of epilepsy, chronic pain, schizophrenia, and violent behaviour;
* automatic defibrillators for assisting damaged hearts; and
* artificial visual implants or assists and image enhancers for the visually impaired.

Pharmaceuticals: Breakthroughs in pharmaceutical products and delivery systems promise radically different medical treatments for many illnesses. Drugs are being developed that act closer to the disease site and are specific to the damaging side effects of older untargetted treatments. Entirely new types of therapeutic agents are being developed, some both more potent and more natural to the body than conventional pharmaceuticals. Some possibilities are:

- *Immunomodulators* — These maintain proper functioning of the immune system, without the problems associated with current cell-killing drugs. New treatments would involve the use of natural substances such as interferon, to modify specific functions in the body. These immunomodulators will be used, first, as therapy for immune deficiency diseases and to suppress the immune system for grafting and transplanting organs, then to enhance the natural killer cells to attack new cancers and other diseases.

- *Neurotransmitters* — Scientists are becoming more familiar with the activities of these materials and new and more effective treatments should follow for Parkinson's disease, Alzheimer's disease, amyotrophic lateral sclerosis (ALS) Huntington's disease and mental diseases caused by neurotransmitter deficiencies. Some pharmaceuticals to enhance or prolong memory are already being tested.

- *Neurotrophic hormones* — It is hoped that neurotrophic hormones may stimulate growth in dying nerve cells that produce the transmitters. Research to identify neurotrophic hormones will probably be followed by large-scale synthesis and treatment. Drugs capable of penetrating the blood-brain barrier could treat loss of function in the neocortex due to severe head injury.

- *Mood-altering drugs* — These drugs have been found to exist naturally in the body as a class of compounds made up of endorphins and enkephalins. Many functions have been attributed to these materials including acting as a pain-blocking analgesia, tranquilizer, and antidepressant. Opiate blockers can be used to modify such behaviours as over eating and aberrant sex drives. These substances, being natural to the body, may not be addictive and may eliminate the side effects of current "mood elevator" and other drugs.

- *Monoclonal antibodies* — These products of genetic engineering have opened up a wealth of new therapeutic possibilities, such as cancer chemotherapy in which the cell-killing drugs would attack only the cancer-causing cells in the body. Toxic chemicals attached to the antibodies would then seek out cancerous cells before being activated. Monoclonal antibodies may also be used to kill donor cells that cause lethal conditions in bone marrow transplantations. They can be made to react with infectious bacteria against which antibiotics have not been successful. They can be designed to behave as enzymes, catalyzing chemical reactions and opening up the possibility of unlimited diversity in specific-acting enzymes.

- *Prostaglandins* — A natural substance in the body, synthesized prostaglandins can be used as anticlotting agents useful in heart bypass surgery, prevention of heart attacks through clot prevention, and treatment of asthma, ulcers and inflammation.

- *Vaccines* — Synthetic vaccines that confer multiple protection could be used for influenzas, viruses that cause cold sores, genital herpes, chicken pox, etc., could be attacked with new vaccines.

New delivery systems may have nearly as mome effects on medical care as new pharmaceuticals them do. Especially important will be the controlled relea drugs at dosages and times that are needed. New ma used for coating will release drugs at a constant rate th degradation, permeable membranes and electric ch Magnetic systems can be used for pulse-released drugs as immunosuppressants for transplant patients and imp pumps will deliver precise dosages for treatment of ca and for delivery of insulin. Dosages can be altered with and, as equipment becomes smaller and simpler, can be by patients to provide their own chemotherapy at ho Another form of delivery system will be sprays.

Reproduction Technologies: For those wishing to have dren, the possibilities of technological help have recently greatly increased. These new assists are not always succ ful, and many carry significant risks and high costs. Th include fertility drugs; artificial insemination using the se of the husband, a selected partner, or an unknown donor in-vitro fertilization using either both parents' germ cel donated eggs and/or semen, with implantation in the uter of either the biological mother or a surrogate mother. Sperm freezing techniques permit an increase in the numbe donors and theoretically make possible the selection of spe cific genetic characteristics for the babies. Frozen embry have increased the ease and success rate of in vitro fert zation and implantation,but raised ethical issues regarding the use of "excess" or left-over embryos. For those wishing t curtail production of a family, technologies will also pro vide choices: injectable contraceptives, a contraceptive va cine, intra-uterine devices for preventing embryo implanation and non-surgical sterilization. These "technologies at the beginning of life" promise to raise a number of serious con stitutional issues.

Science fiction abounds with stories about chimeras an clones. Chimeras are animals with the genes — and char acteristics of two H or more species; in Greek mythology the chimera was a beast that had the head of a lion, the bo of a goat and the tail of a serpent. Clones are animals ge etically identical to a parent, i.e. reproduced asexually, or a sibling (when an early stage embryo is divided and reim planted). These have until recently been considered in the class of fairy tales. But large animals such as valuable cat are now produced in multiple identical copies by removin a fertilized egg after two cell divisions, dividing it and allow ing each fragment to begin cell reproduction again, and implanting each new embryo in the womb of a less valua brood cow. Chimeras have been developed by placing for eign genes in animals as complex as mice. A series of expe iments have produced healthy chimeric mice by implan in the uterus of a mouse, differentiated cells found in tum The interesting issue here is that what were thought to undifferentiated cells in a tumor, actually contained a va ety of tissues-tooth, bone, gland, etc. — from which co be grown an entire animal. It now appears unlikely that hu clones or chimeras will be developed, although the ba are in the long-run apt to be ethical and political rather technical. The evolution of this capability could neverthe result in production of body tissues, or new body parts an at least in theory could allow unisex pregnancy and ch bearing, even by males.

— T.P.S. RA

(Source: Biology and Bill of Rights Special Report, O

EMARENA

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Recycling of Plastics

g of plastics from wastes is slowly building up ɔusiness, largely as a result of the compulsions ern for the environment. Plastics have intensified ıway habits, particularly of packaging materials and shapes including large gallon milk contain-.. The Environment Protection Agency, EPA of reasingly strict on such litter and while return of for soft drinks — whether of glass or PET — has vogue, this is only a very miniscule part of the ste. EPA's goal is 25% solid waste reduction by ıis is a far cry and one estimate is that even 8% to reach. There is a Centre for Plastics Recycling Rutgers University of New Jersey besides other ns and several new companies offering special-s in process, separation, usage of recovered mater-

out different plastics is a difficult operation and inly on physical methods such as gravity differ-itives and compounding materials can upset this. fforts have advanced in separation and recycling , a late starter, is taking advantage of the tech-ilable from Europe. The Centre referred to above ative effort of bottling and packaging companies ers of the Society of the Plastics Industries and formation and news of innovation for a nominal oblem is equally difficult on what to do with the materials. Production waste in the plastics fabri-or is recycled back by the fabricator and genér-not go out as waste. The recycling arises from bricated and used and here the question of diverse nd different properties arise. Where individual pol-recovered such as with PET there is less difficulty g for similar applications. Mixed streams of pol-also be processed for several non-critical appli-

S recyclers are using liquid flotation processes to lymers and fillers such as kaolin. Improved hydro-re used to separate kaolin in a stream of water. Vest Germany is a pioneer and has three plants of 30,000 tonnes in Europe and is moving into USA. lot of uncertainity on quantities available for recyc-creates problems on economic size of the ope-tonnes of household waste is generated per person nd 7% of the weight is plastics. But, much of this tends to get lost when you handle municipal wastes. Shredding, washing, granulation follows electromagnetic separation to remove metals. The plastic is then molded or extruded into fibre or fibrefill and generally used for fence posts, strapping, bumper stickers, lumber , drain boards, geotextiles, etc.

Monomer recovery is attractive where feasible. PET can be used to regenerate polyols which can be used for unsaturated polyester or urethane systems. Microcrystalline polymer (MCP) is also one way for PET, nylon, PP etc. Treatment with hydrocholoric acid and suspending in water as an emulsion enables the MCP to be used as coating for paper. This technology of Battista is to be exploited by a new Canadian firm, and expects good market with paper & pulp processors. Selective solubilisation of styrenic and acrylic polymers helps in separation and recycling of these. The methods of recycling are under study and development with appropriate machines will give a big boost to the recoveries. While most thermoplastic wastes can be reprocessed the thermosets cannot and are only ground to powder for use as filler.

A welcome feature of the plastics recycling efforts is the initiative of some of the major producers of the polymers.

1) Dow Chemical and BF Goodrich are to tie up with WTe Corpn., Bedford MA to collect, separate and recycle PS, PVC, PE and PET in Akron.

2) Dow and Canada's Domtar will take up PET/HDPE recycling in a joint venture using Dow's 'float/sink' technology.

3) Seven polystyrene producers have formed the National Polystyrene Recycling Company to supply new technology to most common wastes and license operations.

4) Du Pont and Waste Management Inc. of Oak Brook in a joint venture to collect, separate and sort out reclaim and market 40 million lbs. a year.

5) Mobil Chemical will start-up a 3 million lb polystyrene recycling plant at Genpark, Leominster.

(Source Chem. Business, Sept 89).

As mentioned earlier Europe is ahead in programmes for recycling of plastics. The latest is a £300,000 programme in UK launched by the British Plastics Federations in two key cities — Manchester and Sheffield. A two year research had been taken up prior to this. The funds are from "voluntary" levies on producers and from consumer groups such as "Friends of the Earth". Anually 1,50,000 tonnes are recycled in UK of in plant waste and post consumer wastes for articles like telephones, bottle crates, film cassette, battery boxes, clothes hangers etc. Collection of waste costs vary but are high and various steps are being taken to attract the wastes. It is only India which has a well-organised system of collection from home, garbage and clearup before sale to a reprocessor. Of course, prices of virgin materials are so much higher in India and so there is a dominant economic motive for recycling in some common simple mouldings. It may not be an exaggeration to say that recycling will establish itself as a complementary part of the plastics industry and account for 5 to 10% of consumption. Though producers will bear the brunt, the increasing cost of feedstocks and production costs will limit their production levels in th to come.

Another study on "Global Plastics Disposability — nate Solutions" by Chem Systems describes this as the of the future. Plastics are 7% by weight of urban solid but 30% of the volume. Present disposal methods ar to be:

	For Landfill Other	Recycling Recovery	Incinera
U.S.A.	85	10	5
W. Europe	55	15	30
Japan	25	5	70

More useful methods such as for energy and res recovery is practised outside of USA. But, USA is exp to catch up in materials like polystyrene, PET & PVC

Another 'down' cycle in polyolefine prices?

After a bumper two years of tight supplies, capacity level operations and very remunerative prices for polyethylenes there has been a sharp fall in prices and in demand growth. Capacity has perhaps expanded faster than demand growth and the inventory build up has also cut into offtake. There is a lot of additional capacity build up along with plans for more ethylene when the damper has come raising doubts about the future. There are fears of a slowdown or mild recession in the US and Europe which could lead to a repetition of the cycle of lower prices. In HDPE the explosion of Phillips large plant has given some relief but the options for the future is clouded with some uncertainty as to whether US economy will grow at 3%, Japan at 4% per year and Europe at 3 to 4% in the Nineties. Matter of greater concern is the build up in Asia and in the Middle East.

Polyethylene market in WE was 7.65 million tonnes in 1988 as against 8.25 million tonnes in US and there are big differences in the grades used:

	U.S.	W. Europe
HDPE	46%	34%
LDPE	35%	57%
LLDPE	19%	9%

This can also add to the imbalance with some grades in short supply. HDPE production declined 1.6% in the first half of 1989 in U.S. as against a 5% of growth in 1988. The US production of LDPE declined in 1988 by 2% and further by 6.2% in the first half of 1989. It is estimated that 3 million tonnes of additional capacity will be added before 1972 --of which 1.6 million will be HDPE with alternative of LLDPE in the same plant. Operating rates are said to decline in 1990 and sales effort may lead to price reduction -- a decline of 15% for all types since beginning of 1989 -- 7 to 9 cents per pound.

There is even greater concern on polypropylene. US a boost with exports but these have started to decline. Exp prices were more attractive than domestic prices but no longer. Capacity expansion is set to far exceed the dem growth in 1990 and capacity utilisation has already dec to 83% in USA. The cycle of demand build up, capa expansion, subsequent over capacity is likely to be repea There is a vast improvement in technology and in the ety of polymer grades but prices for the future are clou Inter polymer competition also comes to play when p fluctuate by wide margin. Phillips have restarted the propylene plant which was not damaged in the blast. US consumption of PP in 1988 was 7.1 billion lbs with sions 40%, injection moulding 27%, blow moulding exports 17% and resale/compounding 14%. Growth in sumption has been lower than the 4 to 5% forecast and ity in 1989 was 8.5 billion lbs. with 88% utilisation export market is what is uncertain with the big build up side. Fibres and filament end-uses have boosted the sion grades and this may continue to grow at high rates reduction may lead to wider use of injection molding for like furniture, housewares, office equipment, luggage brief cases, tys etc. But the prospects are not as brigh looked a year back. European producers are most wo about the build up in the Gulf which not only cuts into export market but also a part of their domestic marke single Europe of 1992 is negotiating on politices and on imports. SABIC of Saudi Arabia is the main comp -- 25th in the world rank of petrochemical companie

India is set to complete the gas cracker in 1990 haps one or two of the other planned projects in 1991 but the international supplier and price situation is lik be far easier by then. But our taxation and high cost and import regulations may not upset our productio

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Plea to ban alcohol exports

The chemical industry has projected a deficit of 67 lakh litres of industrial alcohol during the current season. This assessment excludes the requirement of West Bengal, which depends on Uttar Pradesh and Bihar.

The leading association representing the chemical industry has written to the Joint Secretary, Department of Chemicals and Petrochemicals, requesting him to ban export of alcohol in the changed circumstances.

The alcohol availability during 1988-89 was satisfactory due to huge stocks carried forward at the beginning of 1988-89 season in Uttar Pradesh and Maharashtra. This resulted in storage problems in distilleries, necessitating immediate removal of piled-up stocks. The government, therefore, permitted export of alcohol out of India. The exports took place almost at the fag end of 1988-89 season resulting in negligible carry-over stocks for the current 1989-90 season.

The opening balance with distilleries in UP and Maharashtra are very low. In addition to this, demand of alcohol has increased due to expansion of existing units and commissioning of new units. This would further aggravate availability of alcohol during the current year.

The following are the production in six States (Maharashtra, Andhra, Gujarat, Karnataka, Tamil Nadu and UP) which control about 83 per cent of the total production in the country. Opening balance is 325 lakh litres, estimated production, 7,696 lakh litres and the total availability, 8,021 lakh litres. The demand, on the other hand, is put at 8,088 lakh litres (industrial use 4,565 lakh litres, potable 3,020 lakh litres and other uses 503 lakh litres). This leaves a shortfall of 67 lakh litres and continued export will worsen the tight situation, the association feels.

Among all alcohol-based chemicals, production of acetic acid has increased significantly, almost by 60,000 tonnes, involving an investment of approximately Rs. 70 crores. The major impetus was the demand from PTA plant of Reliance Industries, the single largest consumer. Production has gone up to almost 1.4 lakh tonnes as against the demand of 90,000 tonnes.

Last year also saw massive investments in other alcohol-based products MEG by India Glycols and polyethylene by Abhey Oswal. Other projects are also being proposed for products like butanol, octanol and VAM. In Maharashtra, SM Dyechem is proposing to set up an EO/MEG plant based on alcohol, whose viability has been questioned both on the ground of feedstock availability and price. Rama Petrochemicals is planning project in UP for which the State Government has committed alcohol supplies.

TRANSPEK SHARES FOR WORKERS

Transpek Industries Limited, a heavy chemicals manufacturing unit at Baroda, has set a precedence for the Indian corporate world by allotting shares to its workers more than what is stipulated in the finance ministry guidelines.

Under the guidelines, the companies could reserve five per cent of shares to their employees or workers whenever they come out with an equity issue. But in making available 200 shares each to its 950 employees, Transpek has reserved nearly 23 per cent of the Rs. 72 lakh share issue it recently came out on a rights basis.

This trend-setting allocation of shares to employees at par has been made at a time when the value of Transpek's shares are being quoted at Rs. 185. The company's legal exerts hold that there is nothing to bar a company from issuing shares at par. The consent of the finance ministry and the Contro Capital Issues for issue allotm valid only in case the shares are offered at a premium. The minist tially was opposed to the moves company to overstep the guidelin ultimately gave the green signal

Stating this, Mr. Atul Shroff, man of the company, said Transpe been setting trends in the Indian corp ate world and the latest was a u one. Asked what he meant by un ness of the scheme Mr. Shroff sa 950 workers, each holding 200 shar now hold about 11 per cent equity in the company and he could not rec a similar situation in any other indus unit in the private sector.

Mr. Shroff, replying to questi from newsmen, said the company not given "any thought at the mome to take on the board of managem workers' representatives by virtue their share-holding. This did not me that such a possibility was ruled ou the future, he said. He said the comp employed about 1200 workers. But o 950 workers were given shares beca it was the strength of the emplo when the decision to allot shares workers and the shareholders appro were taken by the board in June las

Transpek, he said, was in the thre old of becoming a Rs. 50-crore co pany and has on hand several dive fication and expansion plans. As whether the 11 per cent stake in hands of the workers did not exp Transpek to a takeover threat, Shroff said, "We do not have any fear". He said gone were the days w the best that was expected of busi was that it should provide jobs, give wages, make contributions to the pu exchequer and place quality good reasonable prices in the market. In strial relations now have a diffe (democratic) face and Transpek's de sion to give equity shares to its wor was a step in that direction added.

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SPIC seeks diversification

Southern Petrochemicals Industries Corporation Ltd (SPIC), which started off as a fertiliser manufacturing company, is gradually shifting its area of interest to other high technology fields in a bid to take care of the uncertainties in the fertiliser business.

As per the corporate strategy, SPIC is aiming at a turnover of Rs. 1,000 crores by 1992 in which the fertiliser business will contribute a 50 per cent share while the other half will come from petrochemical, drugs, electronics, shipping and detergents. The group turnover in 1989-90 is expected to be in the region of Rs. 800 crores of which the share of fertiliser business will be about Rs. 600 crores and the balance is to come from other areas of interest.

Mr. R. Sundarajan, director (finance) of SPIC, said several new projects were being planned to have an even spread of investments in high technology areas. Over the next five years the group would invest around Rs. 300 crores in new projects.

SPIC has tied up with Cipan of Portugal for setting up a drug plant to manufacture penciliin and rifampicin. The project, to be located at Tamil Nadu, will have an investment of Rs. 120 crores and is expected to come up in 1991-92.

Plans are in the final stages to promote a new company, SPIC Fine Chemicals, in technical collaboration with Henkel of West Germany for setting up the country's first phosphate-free detergents. The project cost will be nearly Rs. 50 crores. The proposal is awaiting IDBI clearance. Mr. Sundararajan said that SPIC Fine Chemicals would enter the capital marklet later during the year.

Raw material for the detergent project will come from Tamil Nadu Petroproducts, a joint venture promoted by SPIC and Tamil Nadu Industrial Development Cororation, which manufactures linear alkyl benzene (LAB). Tamil Nadu Petroproducts crossed the Rs. 100-crore turnover mark in its first full year of operation.

SPIC in talks to take over WIMCO unit

Negotiations are in an advanced stage for acquisition by SPIC of the salt unit of WIMCO at Vedaranyam in Tamil Nadu.

This was disclosed by Mr. A.C. Muthiah, Vice-Chairman, SPIC, in response to a question at a press conference convened in connection with the forthcoming public issue of Manali Petrochemicals Ltd. recently.

For SPIC, the unit will be a captive source for consumption by its caustic soda plant which it acquired from the Kotharis some time ago. Earlier, the Kotharis were lifting the salt from the WIMCO unit.

On the proposed Rs. 1200-crore aromatic project being jointly promoted by SPIC and Madras Refineries Ltd., Mr. Muthiah informed that the project has already obtained preliminary approvals and is now awaiting clearance from the Public Investment Board (PIB).

He does not visualise any hitch cropping up at this stage or later as the project is considered essential for the growth of the petrochemicals industry in Tamil Nadu and is also viable.

Explaining the features of the MPL project, he said it will be a 100 per cent import substitution venture as the entire domestic demand for the products (propylene oxide, propylene glycol and polyols) is now met by imports. He pointed out that while the foreign exchange element in Rs. 101.70 crores project cost is worked out at 12 per cent, the plant, once on stream, will help save foreign exchange to the tune of 3 cent of the cost every year. The pl is expected to start trial productio April this year.

The company is entering the ca market with a issue of 1.60 crores eq shares of Rs. 10 each for cash a The subscription will open for the n resident Indians on January 22 and the Indian public on January 29.

J.V. BHAT MEMORIAL SEMINAR: "ERADICATI OF WATER-BORNE DISE STRATEGY FOR 90'S"

A second seminar to comme ate the memory of late Prof Bhat, a doyen of Microbiolo India, will be held in the New A torium of UDCT, Matunga, Bo on 3rd March 1990.

The seminar papers wil presented by eminent scientists leading members of the medical fession and is a unique even honour of the late Prof. J.V. B The seminar will be preceded presentation of papers for Prof. J.V. Bhat-Eureka Fo Award.

The registration fees for part pation is Rs. 75 per delegate, Rs for post graduate students and Rs for undergraduate students. Cros cheques may kindly be drawn favour of "Prof. J.V. BH MEMORIAL FUND", and ma to the following address before 2 February 1990. An exhibition w organised on the day of the semin

For further details please conta Dr. P.J. Dubash, or Dr. M.Y. Ka Co-convenor of Seminar, Foo Fermentation Technology Secti University Department Chemic Technology, Matunga, Bombay 4 019. Tel. No.: 4114302-07.

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service costs. In support of the case for reducing the import duty, the association has observed that there has been an increase in the international price also in recent years. From $ 99 a tonne in November 1988, the price has gone up to $ 140 as of now and the trend may continue, it says.

UNESCO AWARD FOR 10 INDIAN SCIENTISTS

The Indian scientists are among the 15 recipients of the UNESCO/ROSTSCA awards for young scientists, 1989. The award, instituted in 1985 to encourage young talent in the International year of Youth, is given every year to scientists under the age of 35 for their contribution to basic and applied sciences, a UNESCO release recently said. The award is for scientists from the South Asian region.

The award-winners from India are: Miss. Nirmala Saraswat (ecological sciences), Miss. Geeta Saxena, Dr. Mohammad Athar, Dr. Zohra Singh (basic sciences), Dr. T. C. Kandpal, Mr. V. Purnachandra Rao (applied, geological and marine sciences), Mr. Swapan Bhattacharya, Dr. Parthapritam Das, Dr. Vinay Kumar Singh and Dr. Sunil Dattatrya Sherlakar (informatics).

BHOPAL ACT CHALLENGED

A writ petition was filed in the Supreme Court challenging the validity of the $470-million settlement reached in February last year for payment of compensation to Bhopal gas disaster victims.

The petition sought a direction for placing on board a writ petition filed last year challenging the validity of the Bhopal Gas Disaster (processing of claims) Act, 1985 for hearing and final disposal.

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HANDLING HAZARDOUS CHEMICALS

Rules framed to prevent accidents

Rules for the manufacture, storage and import of hazardous chemicals have been framed by the environment ministry with a view to preventing "Bhopal type" accidents and checking "clandestine" dumping of hazardous chemicals into the country. The rules have been framed under the Environment Protection Act and have been notified to come into force, according to official sources.

The rules define a "major accident" as a major emission, fire or explosion involving one or more hazardous chemicals leading to serious effects on man or the environment, causing substantial loss of life and property inside and outside the installation. The ministry had only some time ago framed rules on handling and management of hazardous wastes, which include nuclear wastes.

Describing it as a 'cradle to grave' policy, the sources said that the rules covered all stages of handling of chemicals and wastes from manufacture, storage, import and collection to treatment, transportation and disposal. Ever since the Bhopal gas tragedy in December 1984, a need was felt for having a control scheme on hazardous chemicals. The Environment Protection Act provides the necessary framework for laying down procedures and safeguards for handling hazardous substances and control of chemical accidents of the Bhopal type, the sources said. "This is also reflected in the National Front's manifesto", they said.

The ministry of environment has also been declared as a nodal agency for dealing with chemical emergencies, the sources said. The rules include that 'import' provision in view of the clandestine dumping of hazardous waste now taking place in countries of Africa and Asia, they said.

These rules stipulate that any person responsible for importing hazardous chemicals in India shall provide at the time of import or within 30 days from the date of import to the Pollution Control Board the information pertaining to the name and address of the importer, port of entry, mode of transport, quantity of chemicals being imported and complete product s[illegible] information.

On receiving this information, the Pollution Control Board or any other concerned authority may direct the importer to take suitable steps if the chemicals being imported are likely to cause a major accident. The importer is required to maintain records of all hazardous chemicals imported by him.

The rules also envisage three levels of controls: low, middle and high. Low level controls require that a person in control of an industrial activity takes the necessary precautions to prevent major accidents, to report those tha and take steps limit their conse Middle level controls apply chemicals and other inflamma highly flammable liquids and ble liquids for which quantit been prescribed.

POLYMER PRICES UP

Indian Petrochemicals Corp (IPCL) has revised the price of lymers with immediate effect. Lo sity polyethylene (LDPE) pri gone up from Rs. 29.50 to Rs. & polypropylene quotation has go by Rs. 2 to Rs. 33 a kg. The price lyvinyl chloride, of which there are eral manufacturers, remains unch IPCL is charging Rs. 25 a kg – lowest price among all PVC prod

Meanwhile, all associations repres ting the processing industry made a ted representation to the Union Fin Minister, Prof. Madhu Dandava well as officials of the revenue a chemicals department on Jan. 1 testing against the Government no tion raising import duty on all poly The officials are studying the join resentation by the user industry was not consulted before the duty and may review the decision if su step was warranted, it is learnt. Fo ing the duty hike, Korean produc polystyrene have immediately jack their price by about $200 a tonne

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PHARMACEUTICAL UNITS

Threat to liberalisation

More bulk drugs are expected to come under price control at the instance of the Health Ministry. This is one of the major issues in the review of the drug policy and pricing system being undertaken by the Indian Government.

The Health Ministry wants vitamins and several antibiotics to be included in Category I on the ground that these are vital for the national health programmes. If this takes place, it will be a reversal of the liberalisation ushered in by the last Drug Prices Control Order and the recommendations of the Kelkar Committee.

Officials have also been told to examine whether price increases in decontrolled drugs are justified. Chances are that manufacturers will be told to accept voluntary price freeze for some decontrolled drugs.

A review of the drug policy has also been mooted to see what changes are necessary to bring about the objectives of Indian Government manifesto, namely making cheaper drugs available in rural areas.

Another objective which has been receiving attention — that of encouraging production of bulk drugs will not be served by including more drugs under price control. In order to enhance production of bulk drugs, the Government is prepared to review the existing bulk drug-formulation ratio parameters. At present, these are 1:4 for FERA companies, 1:5 for large units and 1:10 for smaller units.

Time was when the pharmaceutical industry was among the most profitable industries in the country. Today it is among the least profitable. For this reason, financial institutions are not keen on assisting the drug industry in expansion and new projects. The pharmaceutical business of several leading companies is at present subsidised by non-pharmaceutical businesses.

The Department of Chemicals and Petrochemicals (which covers pharmaceuticals) which was formerly part of the Industry Ministry has now been merged with the Petroleum and Chemicals Ministry headed by Mr. M. S. Gurupadaswamy. He is yet to have any meetings with any industry association.

According to industry sources, the main task before the Government is to expedite the pending price revision applications on the basis of the 1987 DPCO. The Secretary, Mr. M. S. Gill, had promised automatic revision of oprices based on indexation of cost sometime ago but has not been implemented. The industry expects the new Government to honour what the previous regimes have accepted in principle: there should be progressive decontrol and price control should be limited to category I drugs only.

Rationalisation of import duty which began during previous administration is also left half done. This is in fulfilment of the principle that import duty on drug intermediates should be lower than bulk drugs in order to encourage indigenous production of bulk drugs. Leading producers have advocated greater use of competition and tariff mechanism rather than direct price control to keep prices under check.

Mr. Gill had promised full weightage for research and development expenditure in pricing while addressing industry representatives in Bombay late last year. This will go a long way in nurturing basic research in the country, which today is almost non-existent. Another way of promoting the industry is to give more incentives for export. Making exports more profitable will go a long way in compensating for the poor
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vt. backs Bhopal gas tims' plea for review

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sion to over-turn the $ 470 million settlement reached last year between India and US-based multinational on compensation for victims of the 1984 Bhopal gas tragedy.

The Carbide spokesman, Mr. Bob Berzok, told the Washington Post that the new Government's announcement did not change the basis for previous court decisions approving the settlement.

"No information has come to light that would suggest that Indian Supreme Court's assumptions that were used in ordering the settlement were incorrect." he said.

The Minister had also challenged a provision in the agreement that granted criminal immunity to Union Carbide executives.

STIONS GOVT.

dr has questioned
[illegible]

OPEC MAY SCRAP OUTPUT CURBS

The sharp run-up in crude oil prices, just as OPEC's January production cutbacks are being felt in the market, could result in a scrapping of those reductions in favour of meeting market demand. If that occurs, reductions would fall short of the 1.5 million barrels per day set in November, postponing a test of the new agreement for three to four months. OPEC's basket of reference crudes was worth an average $19.41 during the last week of December. Nigeria is trimming production by 150,000 to 200,000 barrels per day, while Abu Dhabi is cutting some 350,000 barrels. In an effort to expand direct contract sales with key customers, such as Japan, Saudi Arabia is informing the former Aramco partners, and some other resellers, of a planned supply contract provision intended to prohibit resales of Saudi crude to third parties.

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Govt. move on Carbide historic

The recent announcement by the Union law minister, Mr. Dinesh Goswami, on the Bhopal settlement marks the revival of the rule of law not only for the victims but also for the country's future. In declaring that a "life in India is not so cheap that the worst industrial disaster which affected the lives of lakhs could be compensated by $ 470 million." Mr. V. P. Singh's government has sought to restore the dignity of the poor in the third world.

In this sense this historic announcement creates a human rights endowment for all the people of the third world who remain exposed to the mercy of the multi-nationals. The government deserves the nation's applause for acting boldly on the basis of axiomatic moral principles. The strategy of action outlined in the announcement has four important components. First, it declares that the victims have certain "inalienable rights" to remedies. This recognition is entirely consistent with the parental role of the government writ large in the Bhopal Act which has been further elaborated by the supreme court in its December 22 decision.

The *parens patriae* role repells any suggestion of antagonism between the govt. and the vitcims. The Union by the innate logic of the Bhopal Act, is both on behalf of and at the behest of the victims. This logic was unfortunately obscured by last year's settlement. Now it stands vigorously reinstated.

Second, the announcement recognises the right to interim relief. The one-time interim relief programme is not just bureaucratically announced. Rather, the victim groups are to participate in this decision-making process. Thus both the principles of right to information and of participative administration stand inaugurated . The victim groups have proposed a draft ordinance for interim relief
for 106,000 families in 36
wards of Bhopal acknowled
Madhya Pradesh governmen
directly gas-hit. The annual
on this relief was in the order
crores.

Judge Deo had ordered
of Rs. 350 crores which the
Pradesh high court had
Rs. 250 crores. In the discussio
will follow it is clear the one-time
will entail a substantial outla
region of Rs. 250 to 350 crores

Third, the announcement
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and the actual personal injury
already filed exceed 1,00,000. Th
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of victimage is a significant
through in the struggle for just

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Phenol/D.E.G./M.E.G.
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Aceto Acetic Methyl Ester
Caustic Potash/D.E.S.
Dimethyl Acetamide
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Separation of 2,4 and 2,6 TDI

UOP have claimed that Y-zeolite cation exchanged with K selectively adsorbs 2,6 isomer. By contrast Y-zeolite cation exchanged with Na, Ca and Li selectively adsorbs 2,4 isomer. (E.P. 324,215, July 1989, *Chem. Abstr.* 1989, **111,** 174835).

Solvent selection for extraction from dilute solution

Cockrem, Flatt and Lightfoot have suggested an improved strategy for the selection of solvents for recovery of chemicals from dilute solutions. Key parameters are low solvent losses and high solute distribution coefficient. High solute-solvent b. pt. difference is important. An example pertaining to recovery of **n**-Butanol is given. (*Sep. Sci. Technol.* 1989, **24, (11)**, 769).

Biotechnology

Biocatalysts

The successful application of biocatalysts requires combined skills of both biotechnology and classical organic synthesis (and fortunately the cultural gap between the two areas is now becoming closer). New technological developments stem from, for example, strain optimization through recombinant DNA and molecular modelling; there have been notable developments in bioreactor design. Now liquid-liquid reactions can be conducted with enzymes as catalysts. The well known example is that of 6-APA and 7-ACA. Biocatalysts are now available for the conversion of 2-methoxy-6-isopropylnaphthalene into the naproxene entomer. (*Performance Chemicals,* 1989, Sept./Oct., p. 20).

There are many unique areas where biocatalysts carry out transformations which are not possible with known organic synthesis procedures. For instance conversion of benzene to (benzene *cis* glycol) dihydrocatechol (also haloderivatives of benzene to the corresponding dihydrocatechol). The use of acylases and hydantoinases in semi-synthetic penicillins is growing. Chloropropionic acid has been resolved. The synthesis of L-phenylalanine is also carried out with biocatalysts. (C. Evans, *Performance Chemicals,* 1989, July/Aug., p. 58).

Fermentation n-butanol from CO

M. Worden (of Michigan Biotechnology Institute, USA) has succeeded in converting CO to **n**-butanol at ambient temperature and pressure, even in the presence of sulphur impurities. As of now, **n**-butanol conc. is very low at 0.5 g/litre. (*CMR,* 1989, 20 Nov., p. 5).

Centrifugal field bioreactor (CFBR)

Mersmann and co-workers (from Munich, FRG) developed a CFBR which should be useful f increasing productivity of growth and growth linked duction with microorganisms at high cell densitie increasing the productivity of highly viscous pse plastic polysaccharide fermentation. Higher O_2 tra rates are possible for highly viscous liquds. Furthe centrifugal field reduces the problems associated foams. For the first time, exoprotein biosynthes lipase with *S.Carnosus* has been carried out under rile and controlled conditions. (*Chem. Eng. Tech* 1989, **12,** 364).

Cultured plant cells (CPC) -- the chemical fac within

Dicosmo **et al** have given a nice account of this sub which is important as plants are the most impor source of land-based foods, oils, and fibres, and rep sent an immense repository of biochemicals includ flavours, essences, pigments, fine chemicals, pharm ceuticals and novel biologically active substances. M of these products are secy. metabolites with wide str tural variety, but, often specific taxonomic plant grou yield specific homologues. Examples of *Catharant rosens, Tagetes Patula, Cinchoria liedgardina, Men Spicata, Artemisia Annua*, etc. may be cited. (*Chem. Br* 1989, Oct., 1001).

Reduction of ketones with montmorillonite supporte borohydride

Sarkar **et al.** have reduced a few cyclic and acy ketones in dichloromethane with reusable montmori nite supported borohydride. A high percentage of a attack (76-100%) by hydrides on substituted cycloh anones was observed. A phase transfer catalyst li benzyl triethyl ammonium chloride was also incorp ated in the solid supported reagent. Ketones like 4 butyl cyclohexanone; 3,3,5-trimethyl cyclohexano acetophenone; etc. were used. (*Synthetic Communi tions*, 1989, **19,** 2313).

tert-Aliphatic carboxylic acids from correspondi alcohols using sulphuric acid and CO

Takahashi and Yoneda have shown that concentra sulphuric acid, supersaturated with CO (via *in situ*) de dration of HCOOH), can be used for the reaction un reference to make 'neo' acids via Koch-Haaf car ylation. Solvent used were CH_3COOH, CCl_4, Nearly quantitative results were obtained. RA_1R_2R where R_1R_2R were Me, ET, iPr, iBu, etc. (*ibid.* 1 **19,** 1945).

n of alcohols from aqueous solutions

claimed that 5-perfluorononyl oxyisophthaic a complex with alcohol which can be decom- p. Pat. 63,275, 536, Nov. 1988, *Chem. Abstr.* , 176723).

l styrene (IBS)

e used as a starting material for two-step con- o ibuprofen. Isobutyl benzene can be reacted taldehyde and diarylethane obtained can be o give IBS. (E.P. 316,014, May 1989, *Chem.* 989, **111,** 176725).

lammonium dimethyl carbamate (DIM-

et al. have brought out some very useful prop- DIMCARB which is soluble in most organic and even more interesting, even as a carba- stillables at 60-61°C. The components of DIM- dimethylamine and carbon dioxide, are able to lividually. Thus DIMCARB can act as a con- carrier for the volatile dimethylamine. Thus hloride can be reacted with DIMCARB to give imethylamine. (*Chemik-Zeitung*, 1989, **113,** No. 71).

und (US) in organic synthesis

has given a state-of-the-art account of this sub- omewhat of an uncommon journal — *Aldrich- ta* (1988, **21,** No. 2, 1-42). The origin, nature cription of the sonochemical effects are given at set. Next the sonochemistry of organometallic s and miscellaneous applications of ultrasound rogeneous reactions are covered. Thus the ement of Ullmann coupling reaction due to US n covered. Sonication favourably influences the of the Simmons-Smith cyclopropation reaction n dichloromethane in the presence of alkenes.

on of alcohols by solid $KMnO_4$ under US con- giving yields even approaching 93%, has been . By contrast with only mechanical agitation were typically below 10%.

n E and its related compounds as antioxidants

i has given a very useful account of as to how n E acts as a potent and safe, lipid-solute anti- t by scavenging primarily chain-carrying peroxy and interrupting chain sequence. Niki has stressed antioxidant properties *in vivo* are determined not the inherent reactivities of tocopherols and tocotrienols but also by their local concentrations at a specific site where the oxidations are taking place. (*J. Synthetic Orga. Chem., Japan*, 1989, **47,** No. 10, 902-915).

2,3,6-Trimethyl hydroquinone (TMHQ) from 2,3,6-trimethyl phenol (TM)

TMP, dissolved in a mixture of an aromatic hydrocarbon and C_{1-4} aliphatic alcohol, can be oxidised with O_2 using $CuCl_2$ and LiCl combination as a catalyst and a limited amount of water. (Jap. Pat. 63,280,040, Nov. 1988, *Chem. Abstr.*, 1989, **111,** 173762).

One-pot two-steps synthesis of 1,2-diol

Fringuelli **et al.** have shown that epoxidation followed by hydrolysis of alkenes with **m**-chloroperoxybenzoic acid (MCPBA) can be done in water with high yield and complete **anti**-stereospecificity. Olefins like cyclopentene, cyclohexene, styrene, etc. were used. The alkene is first epoxidised by MCPBA in water and then the epoxide is directly opened by acid or basic hydrolysis without being isolated. (*Synthetic Communications*, 1989, **19,** 1939).

Catalytic hydration of propylene: Zeolites as catalyst

Mobil have claimed that ZSM-35 catalyses the hydration of propylene in vapour or liquid phase; at a mole ratio of propylene to water of 1:2 and 166°C and 70 atm. pressure, 55% conversion of propylene was realised and selectivity was 99.5%. (E.P. 323,269, July 1989, *Chem. Abstr.*, 1989, **111,** 176743).

Selective hydrogenation of benzene to cyclohexene

Mitsui Petrochemical Ind. have claimed that Ru on hydrotalchite allows selective hydrogenation of benzene at 150°C and 50 atm., the wt. ratio of water to benzene was kept at 4. At 16% conversion of benzene the selectivity for cyclohexene was 47%. (E.P. 323192, July 1989, *Chem. Abstr.*, 1989, **111,** 176745).

Selective ortho alkylation of arylamines

Burgoyne **et al.** (of Air Products) have given an interesting and industrially useful account of selective ortho alkylation of aniline, toluidine, toluenediamine, phenylenediamines, etc. with olefins like propylene, isobutylene, etc. Thus with H-Y zeolite at 92% conversion of aniline, 2-isopropylamine and 2,6 diisopropylamine were formed at 25% and 39%, selectivity respectively. Similarly 2,4 toluenediamine can be alkylated with isobutylene with 85% selectivity at 84% conversion. (*Chemtech*, 1989, Nov., p. 690).

Selective reduction of α-ß unsaturated carbonyl compounds

Hazarika and Barua have used a combination of A1 and Ni chloride in THF for selective reduction of the olefinic double bond of the α-enone system. A variety of α,ß unsaturated carbonyl compounds were used and in some cases yields were as high as 85%. (*Tetrahedron Lett.*, 1989, **30,** 6567).

Microwave oven (MWO) for reactions: From the kitchen to the laboratory

Walton has given a brief account of this subject. The role of water in materials for MWO is well known; water or aqueous solutions get heated but **not** the cup made of ceramic or plastic. Esterifications, hydrolysis of esters/amides, oxidation of alkyl benzenes, nucleophilic substitutions, etc. are typical reactions which have been conducted in MWO. A 1240-fold rate enhancement in the reaction of 4-cyanophenoxide ion with benzyl chloride in methanol has been reported; this type of reaction is relevant in the conversion of morphine into codeine. Solid supported reagents based reactions have also been promoted in MWO. (*Performance Chemicals*, 1989, July/Aug., p. 46).

HLB for emulsification

Graciaa **et al.** have given a critique on the concept of HLB where a common knowledge is that different materials having the same HLB do not lead to the same degree of emulsification. It seems that the partitioning of the emulsifiers in two phase, resulting in the variation of HLB number can explain this anomaly. (*Langmuir*, 1989, **5,** 1315).

Polycarbonate/polyarylates by a new technology

G-E have achieved a breakthrough in TP polycarbonate (PC) which allows even composites to be made with PC and this may well lead to a substantial increase in sales. Here bisphenol A is converted to bis(chloroformate) ester and then reacted to form cyclic oligomers ranging from dimer to eicosamer (n=20) and these are low viscosity 'melts'. The oligomer formation is promoted through the use of trimethylamine (TEA), as a catalyst. There is another strategy where the bis(chloroformate) in methylene chloride is added slowly to a vigorously stirred mixtue of methylene chloride, water, bisphenol A, sodium hydroxide and TEA. The cyclic oligomers are polymerised with anionic catalyst like lithium trifluoroethoxide in boiling **o**-dichlorobenzene at 180°C. Crosslinked polycarbonates have also been made. This technique will also allow RIM.

The above strategy can also be applied to polyary where bisphenol A is reacted with isophatholyl chlo (*Chem. Eng. News*, 1989, 25 Sept., p. 35).

New catalytic route for alphaolefins (AO)

Union Carbide have developed a novel ligand prom having P and sulphonate moities capable of bidend coordination to transition metals (e.g. Ni). These ca lysts are more than an order of magnitude better t the known catalysts and product can be manipulated o a wide range. (*Chem. Eng. News*, 1989, 25 Sept., p.

A novel use of MTBE

Methyl *tert* butyl ether (MTBE) has been found t a good solvent for removing gallstones! Treatmen an average of 5 hours allows removal in 1 to 3 d Tests on humans are being carried out. (*Chem. B* 1989, Oct., p. 975).

Asymmetric oligomerisation of propene and 1-bu

Kaminsky **et al.** have shown that approximately 8 stereoselectivity in the creation of the second chiral cen is observed when chiral zirconecene complex (S together with methyl alumoxane is used as a catalys complex is [Zir(CH_2-indenyl)$_2$ O_2C-CH(OAC)Ph (*Angew. Chem. Int. Ed. Engl.*, 1989, **28,** 1216).

Enzyme-catalyzed enantioconvergent polymerizat of beta-hydroxyglutarate in organic solvents.

Gutman and Bravdo have developed this strategy f symmetrical hydroxydiesters and dihydroxy monoe ers which exploits the prochiral sterospecity of enzyme in organic solvents. Thus chiral polyesters from achi monomers possessing alpha-symmetry can be made. *Org. Chem.*, 1989, **54,** 5645).

SO_2 removal from flue gas

Dow have claimed that high boiling point hydroxyal -2-piperazinones (more than 0.1M) can be used to abs SO_2 between 5 to 95°C; thermal regenration is satisf tory. The feed gas can have SO_2 from 10 ppm to vol. %. (*Process Eng.*, 1989, **Sept.,** p. 23).

Removal of phosphates down to 0.15 mg P/l

Wastewater containing phosphates can be precipit with lime or iron/aluminium salt, in the presence o magnetic carrier like magnetite and then High Grad Magnetic Separator (HGMS) can be used. (*Pr Engg.*, 1989 August, p. 19).

ON POLYMERS

ssors, producers at loggerheads

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rs not on the basis of their
the landed cost of imports.
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of polymers.
be the consequences of the
duty hike? One, indigen-
rs will raise their prices
Growth in mass-consumed
PVC pipes and new appli-
be stunted. Agricultural
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like Plastindia will take a

Resin Manufacturers Asso-
velcomed the duty hike and
he processors' version.
Mr. S.C. Jain, President of
on, "the c.i.f. price of PVC
00 in March 1989 to $600
ary, 1990. Even taking into
depreciation of the rupee
5 to Rs. 17 a dollar, the
of imported PVC has come
s. 3,300 per tonne in this
e decision of the Govern-
rease the duty from prefer-
by an effective Rs. 3,500 a
ot come a day too soon.
is duty increase, the landed
cost of imported PVC will be approximately Rs. 23,000 as against the lowest Indian price of Rs. 25,000 a tonne".

How much will local producers gain if they were to raise their prices to a level of Rs. 2 less than the landed price of imported polymers? About Rs. 425 crs. According to an industry expert, the public sector, IPCL will be the single largest gainer, collecting Rs. 125 crs. The temptation to raise prices in a protected market is hard to resist. This is not to suggest that producers are rapacious and processors are angels. Many processors on the quota list of local producers calling themselves small units are too small to be detected by the naked eye.

R & D IN INDUSTRIAL SECTOR: ASSOCHAM DRAWS UP EIGHT-POINT PLAN

The Associated Chamber of Commerce and Industry of India (ASSOCHAM) has drawn up an eight point programme to speed up research and development in the industrial sector in the context of trebling expenditure on science and technology to three per cent of GNP as envisaged in the Eighth Plan.

The chamber has suggested a new approach to R & D both in terms of content and methodology so as to derive optimum advantage at minimum cost. According to the ASSOCHAM study on "investment on science and technology during the Eighth Plan period", the thrust in the future should be on innovative and export oriented R & D with socio-economic relevance rather than theoretical, supportive or mere problem solving research.

The research and development, according to the study, should not only aim at improving productivity and quality of products and cutting down of costs, but also on immediate commercial exploitation.

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Industry shocked by import duty rise on plastic raw materials

The government decision to effect a steep increase in import duty on polymers has shocked the plastics industry, particularly when the prices of polymers in the international markets have already gone up substantially.

A large number of plastic units in the small scale sector are already finding the going tough because of a substantial increase in raw material cost, and the industry circles fear that this additional burden in the customs duty may force many units to down their shutters.

The polymer prices in the international market have gone up by 20 per cent to 35 per cent during the last 10 to 12 weeks and the new notifications are likely to immediately increase further the raw materials costs by Rs. 2,700 to Rs. 10,500 per tonne, according to Mr. Vijay Merchant, president of the All India Plastics Manufacturers' Association.

The price of high density polyethylene (HDPE) during past few weeks in the world markets has gone up by 30 per cent to 35 per cent, that of LLDPE by 25 to 30 per cent, polypropylene by 20 per cent and polystyrene by 25 per cent. With the new hike in the import duty, the cost of polystyrene will go up by Rs. 10,500 per tonne, that of LLDPE by Rs. 5,000, polypropylene by Rs. 8,500, HDPE by Rs. 2,700 and PVC by Rs. 3,500 per tonne.

"Surprisingly, the hike in duty has come at a time when the plastics industry was expecting relief from the high cost of raw material", said Mr. Merchant. Already the polymer prices in India are the highest in the world and countries like China, Thailand, Indonesia and Sri Lanka had halved the duties on imports of raw materials realising the real potential of polymers, he added.

The increase in import duties will induce local producers to hike their selling prices further and the ultimate sufferers would be the small-scale industry sector and the agricultural sector, whom the new government wishes to support, Mr. Merchant stated.

Important applications such as water management, canal lining, drip and sprinkler irrigation, packaging farm products and the common man's low-cost necessities will greatly suffer with this additional burden of polymer costs, he added.

KRIBHCO SEEKS ASSENT FOR UREA PLANT

Undeterred by the recent rejection of its bid for the fertiliser project at Shahjehanpur, the Krishak Bharti Cooperative Ltd. (KRIBHCO) has expressed its readiness to set up an ammonia-urea complex anywhere in the country. The complex is among the various projects planned by the premier national level cooperative society whose gas based fertiliser plant at Hazira has proved its track record. The plant has produced more than six million tonnes of urea in the last four years.

KRIBHCO's operations director, Mr. H.S. Kohli, told newsmen that the society believed that the Government would recognise its past performance while allotting future projects. The giant cooperative was formed in April 1980 and has more than 1800 cooperative societies as its members with a total share capital of Rs. 446.14 crore.

Though the main objective of KRIBHCO is manufacturing and marketing of fertilisers and other agro-inputs, as part of its diversification programme it has also proposed to set up a petrochemical complex near Hazira. Mr. Kohli said that the society wanted to go in for the petrochemical field in view of the availability of the gas at Hazira.

As the organisation has g
substantial internal resources,
plans to augment and moder
ammonia capacity at H
KRIBHCO has also made a pro
the Government for setting up
venture with Jordan Phosphate M
produce the much needed pho
acid with an investment of R
crore, Mr. Kohli said.

Mr. Kohli said the perform
KRIBHCO had led the Departm
Atomic Energy to entrust it wi
responsibility of executing H
ammonia extension project.

The erection work of the proj
almost over and the project is lik
be completed much before Novem
this year, its scheduled date of com
tion.

KRIBHCO's record on the fro
environmental protection and pol
control was lauded recently wi
plant getting an award set up for
purpose by the Fertiliser Associatio
India for 1988-89.

'BASEMENT OIL' OUTPUT TO STEPPED UP

The State-run Oil and Natura
Commission (ONGC) plans to se
oil production through an empha
'basement oil' production. ONGC
ces said at Calcutta that a pla
already been made for producti
such oil from the fractured bas
rocks of western offshore. "It will
tially be new oil from our old fi
they said.

For starters, ONGC envision
extract about one million tons of
ment oil every year from 19
onwards. Operational and fin
details on this count were still
worked out. As things now sta
thrust of the new ONGC plan wa
on Bombay High.

URING VAM

I Viscose proposal rejected

nent has rejected the pro-
n India Viscose Limited
facture of 10,000 tpa of
monomer (VAM). The
g Rs. 36 crores was pro-
set up at Parangipettai in
istrict of Tamil Nadu. The
l proposed to finance the
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ores for the manufacture of
acrylonitrile and acrylic fibre, having a licensed capacity of 70,000 tons and 20,000 tons each with an estimated annual turnover of Rs. 154 crores and Rs. 140 crores, respectively.

The company proposes to finance the project cost of Rs. 360 crores by way of term loans from financial institutions (Rs. 200 crores), debentures (Rs. 110 crores) and internal resources (Rs. 50 crores).

The second project involving an investment of Rs. 167 crores is for the manufacture of styrene and polystyrene having a licensed capacity of 80,000 tons and 40,000 tons each with an annual estimated turnover of Rs. 148.80 crores and Rs. 128.30 crores, respectively.

The cost of the second project Rs. 167 crores, is proposed to be financed through loans from financial institutions and debentures (Rs. 125.25 crores) and internal resources (Rs. 41.75 crores).

South India Viscose responds to ONGC's call for indigenous lignosulphonates, saving the nation valuable foreign exchange

South India Viscose Ltd., Coimbatore, in technical and financial collaboration with Dressers Magcobar (M-1 Drilling Fluids) U.S.A. will manufacture lignosulphonates. Dresser has lignosulphonates manufacturing plants in Brazil & U.S.A.

The new company SIV-Magcobar Lignins Ltd., Coimbatore is the subsidiary of South India Viscose Ltd. The company will have an investment of Rs. 6 crores. Dressers participation in the equity of the subsidiary is 40% while that of South India Viscose Ltd. is 60%.

The project was conceived in 1982. It took considerable time to establish the minimum economic viability from the domestic, Middle East and near Far East markets. The plant located at Sirumugai has an installed capacity of 12,000 tonnes lignosulphonates per annum. Beginning with the capacity of 6000 tons, output will double at the commencement of the second year and touch the 12,000 ton mark. 50% of the total production will meet the requirements of ONGC, Oil India Ltd. and foreign oil companies operating in India. Remaining production will be exported to South East Asia.

As a result of close interaction of the two companies the plant has less than 1/2 % of imported capital goods. The plant also incorporates the latest technology.

The supply of lignosulphonates to ONGC will be made from 100% indigenous raw materials. This raw material (calcium bisulphite solution, commonly referred to as wood liquor) is a by-product of South India Viscose's pulp plant.

SIV-Magcobar Lignins Ltd., will manufacture four grades of oil field lignosulphonates and 20 types of industrial grade lignosulphonates which find application in concrete mixes, refractories, briquetting, dyestuff, cement, foundry, cattle feed and dry-cell batteries.

The country is currently importing its entire requirement of lignosulphonates from U.S.A., Canada and the Scandinavian countries. SIV-Magcobar Lignins Ltd., will therefore not only lead to import substitution, but will earn the country valuable foreign exchange.

The construction of the plant was commenced in mid September 1989 and it is gearing up for its first physical export in February 1990. As a result of tremendous interest from domestic and international customers the company is already planning its phase 2 and phase 3 expansion programme.

New exim policy to ease procedures

The new export and import policy (exim) to be announced in April will focus on procedural simplifications to further boost exports. This assurance was given by the Commerce Minister, Mr. Arun Nehru, while responding to complaints of the Marine Products Export Development Authority (MPEDA) at a review meeting at New Delhi.

The Authority had pointed out that the prospects of sea food exports were being hampered due to procedural delays in the allotment of land for development of prawn farming and chartering of vessels for deep-sea fishing.

The Minister favoured single window clearance for all export sectors, including marine products, and said he would take up the matter with the Finance Ministry and other agencies concerned. Denouncing procedural delays for their "harmful effect" on exports, the Commerce Minister said he found it "absurd" that the exporters were in many cases required to approach scores of agencies for obtaining a single clearance.

In a strategy paper on development perspectives in the Eighth Plan 1990-95 for marine exports sector presented to the Minister, MPEDA has pointed out that the overall growth in India's seafood exports had been slower than that of countries like Thailand and Taiwan. This was largely because of delays in implementing development schemes in the fisheries sector.

Exports of Indian marine products form only 0.31 per cent of the total quantity of world marine exports and only 1.3 per cent of the total value of world marine exports. This was in spite of the fact that the resource potential in the two million sq. km. of India's exclusive economic zone (EEZ) wa 4.5 million tonnes. Of this, only lion tonnes are currently ex mainly from the onshore regio

OLD POLICY EXPIRES ON MARCH 31

The life of the existing thr exim policy has been curtailed year following the Governmen sion to adopt a new policy from 1. The existing policy was va three years from April 1, 1988 to 31, 1991. Accordingly, the ex Exim policy and the hand book of cedures will cease to be vali April 1, 1990, it was offic announced.

The validity of the open ge licence (OGL) order has also been tailed up to March 31, 1990. Howe shipments would be permitted up June 30, 1990, in respect of firm or backed by irrevocable letters of cr opened before February 28, 199 case letters of credit opened afte ruary, imports would be permi only if shipments were effec March 31, 1990.

The last date of receipt of appli by the licensing authorities for supplementary licence for impo material and components as w application from new units du ommended by the sponsoring au ties has been notified as Februar 1990.

ESCAP FORESEES 5% GROWT RATE FOR INDIA

The Economic and Social Counci Asia and Pacific (ESCAP) says pro tions show India will have around per cent growth rate during the ne years. Quoting the organisation's jections on Asia's economic trend ESCAP Executive Secret Mr. S.A.M.A. Kibria, said India w have a growth rate of 5.2 per ce 1990 and 4.7 per cent in 1991.

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CRISIS OF GLUT

Plea to stop aluminium imports

The aluminium industry has urged the Government to put a stop to the "unwanted inflow" of imported metal into the country. This will help improve the health of the domestic industry which is at present passing through a crisis caused by a glut in the market, according to Mr. P.S. Gupta, Executive Director (Commercial), Bharat Aluminium Company Ltd. (BALCO).

Talking to newsmen at Madras recently, he estimated that between April and December 1989, nearly 50,000 tonnes of aluminium ingots were imported into the country leading to a glut in the market. In terms of value, this amounted to a foreign exchange outgo of about Rs. 150 crores.

Mr. Gupta explained that the country has not only become self-sufficient in aluminium but has also generated exportable surplus. In 1989-90, while the domestic production is expected to be in the region of 4.30 lakh tonnes, the demand will be around four lakh tonnes, leaving a surplus of 30,000 tonnes that could be exported.

But, unfortunately for the country, the international price as quoted on the London Metals Exchange (LME) has been on the slide, from $2200 per tonne in February last year to $1600 per tonne in December. With the metal being cheaper outside, its import, placed under OGL, has gained momentum, Mr. Gupta said.

In this context, he noted that LME prices are highly speculative and not related to the cost of production. In fact, only five per cent of the world trade in aluminium is done through LME with the remaining 95 per cent transacted through other channels like bilateral arrangements.

Mr. Gupta called upon the Government to take measures to encourage export of aluminium and its products. Also, the excise duty structure for the metal should be rationalised.

Answering a question, Mr. Gupta said the industry has been faring well, particularly after the decontrol of aluminium. Many companies have registered good profitability. He, however, hastened to add that the industry has not taken any "undue advantage" of the changed situation and the prices have been maintained.

He pointed out that there was tremendous potential for the growth aluminium industry in the country. Though India has the fifth largest bauxite reserves, the production constituted only 2.6 per cent of the world production. This is a paradox.

The public sector BALCO, on its part, has programmed to tap the potential to the extent possible. To begin with, the company is considering the possibilities of expansion of its smelter, extrusion and rolling mill facilities.

Mr. Gupta disclosed that BALCO will set up a new extrusion plant at Korba with an annual capacity of 16,000 tonnes and costing around Rs. 4.5 crores. Besides, the company is planning expansion and diversification of existing facilities in collaboration with Hydro Aluminium of Sweden which is currently in the process of preparing the feasibility report. This apart, with a view to protecting the environment and conservation of wood, the company is considering tie-ups with auxiliary units for production of various items, he said. Mrs. Usha Roy, Director (Personnel), BALCO, was also present at the press conference.

FIRST NATIONAL CONGRESS ON METALLIC CORROSION

Second National Convention of Electrochemists and First National C on Metallic Corrosion will be organised by Society for Adva of Electrochemical Science an nology (SAEST), Karaikudi, N Corrosion Council of India (NC Central Electrochemical Resea tute (CECRI) Karaikudi, during February 1990 to 1st March 19

In order to enthuse and encou young workers the emphasis in meet will be on young scientists students. Young scientists who have tinguished themselves in their ch field will be invited to present th work/latest achievements. A numbe teachers, students, scientists and in strialists will be participating in t meet. There will be a poster sess exclusively for students. Synchronis with this national meet, the first natio congress on metallic corrosion wil held on the 1st March 1990. A numb of key note papers and case studies w be presented.

Those interested to participate m immediately contact: Dr. N.S. Renga wamy, Secretary, Society for Advanc ment of Electrochemical Science an Technology, (SAEST), Karaikudi-6 006. Tamil Nadu.

ISRO TO STUDY OZONE DEPLETION

Under a recent protocol signe between the Indian Space Resear Organisation and the Soviet Sta Committee for Atmospheric and Env ronmental Studies, the ISRO is to tak up a major study of the ozone an metereological parameters over India According to an ISRO press releas tri-weekly metereological rockets wi be launched from the launch pad Thumba during January 15 to May 1 1990 for the purpose. During the Marc April period, 20 rocket flights carryi Indian and Soviet ozone measuring p loads will conducted while RH-2 metereological rockets would launched from Balasore.

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BI plan to revive MALCO

Development Bank of
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a position to increase the price in the wake of stiff competition posed by other companies. Under the circumstances, the higher tariff rate of 97 paise charged from April 1 last year has imposed a heavy financial burden on the company.

At the same time, favourable market conditions for aluminium are coming to the rescue of MALCO. It had exported about 9000 tonnes of alumina to China and it is also supplying 500 to 600 tonnes every month to the domestic market.

It is able to benefit from the current demand for the intermediary product as Indian Aluminium Company, a major producer, has cut its production of alumina after the decontrol order.

After a gap of several years MALCO has made a cash profit of Rs. 12 lakhs during the year ended March 1989. But it has a huge accumulated loss of Rs. 16 crores. In the first six months of the current financial year (upto September 30), it has earned a cash profit of Rs. 20 lakhs.

The state government took the stand that the energy quota could be raised to MALCO, provided it was ready to pay the normal tariff fixed for HT industries. But, in a swift move, the governor's regime had declared that the company would be able to avail itself of additional energy and demand quota at normal HT tariff rates so as to improve its working.

An agreement to this effect, drafted by the TNEB's lawyers, and approved by the advocate general, was also reached. It was then agreed that all the pending appeals in the Supreme Court filed by both MALCO and TNEB will be withdrawn.

On its part, the union government increased the retention price of MALCO to cover the tariff rate of about 80.2 paise per unit demanded by TNEB.

However, coming as a bolt from the blue, the chief minister of Tamil Nadu, Mr. M. Karunanidhi announced in the assembly in March last year that his government would not abide by the agreement and would pursue the appeals in the Supreme Court. He alleged that the company's case was hastened just before the assembly elections for "political reasons". Subsequently, TNEB also filed an application in the Supreme Court to recover its tariff arrears.

LEATHER TRAINING CENTRE AT CLE

A centre for training and product development has been set up at the leather centre of Council for Leather Exports (CLE) to meet the manpower requirements of the industry.

According to Mr. M. M. Hashim, chairman of the council, the centre will provide training. It has been promoted with assistance from industry and Rs. five lakhs grant given by Indian Bank.

Speaking on the occasion of opening of the centre recently at Madras, Mr.Hashim stressed the need to set up such centres in other parts of the country. During the Eighth Plan period alone the industry would require about 25,000 trained manpower.

In his inaugural address, Mr. M. Gopalakrishnan, chairman and managing director of Indian Bank, said the enormous potential for expansion and diversification in the industry could be exploited only by increasing the number of trained technical hands. The infrastructure network also had to be strengthend.

Mr. A. Sahasranaman, executive director of CLE, also felt that the sustained growth of the leather industry would be possible only strengthening the training facility.

Tatas keen to invest in titanium unit

The initiative taken by the Kerala industry Minister, Mrs. K. R. Gouriamma to seek Tata's participation in the States titanium industry has to be viewed in the light of the imperative and urgent need to modernise this unit to retain Kerala's commanding position in this field.

The Industries Minister has set at rest all speculations about how and when the Tata team had come. In an exclusive interview, she said that it was on her invitation that the Tata team headed by Mr. N. S. Sunder Raj, Managing Director of Tata Oil Mills (Tomco) had reached the capital for discussion a few days ago. Now the matter has to be taken with the ruling front for the political clearance required.

But the minister is personally convinced that participation of some industrial house which can bring in modern technology and required funds is essential for saving Kerala's titanium industry from extinction. The technology used in the State-owned Travancore Titanium Products (TTP) is more than four decades old and the efforts made by the management and the Government for upgradation of the technology had failed. British Titanium (now Tioxide) the original collaborator, has not been willing to co-operate. Titanium technology is a closely guarded secret of a handful-of companies in the west.

Mrs. Gouri said her only consideration in exploring the possibilities of a tie-up with Tatas is that titanium industry in Kerala has reached a stage where upgradation of technology, expansion and efficient management have become "an urgent necessity" to retain the monopoly it has been enjoying so far. She is dissatisfied with the present condition of the two State-owned units —Trivancore Titanium Products Ltd. (TTP) and Kerala Metals and Minerals Ltd. (KMML) at Chavara near Quilon. The first one is making some profit but the other one had already sustained a loss of Rs. 80 crores.

The profit being made by TTP is the outcome of steady hike in prices of its product taking advantage of its position as a monopoly producer in the country and the high import duty (85 per cent) imposed on the product by the Government of India. The Indian buyers who are waiting in the queue have been lifting the allotment given to them in trickles after paying whatever price the Kerala State Industrial Trading Corporation (KSIPTC), the agency set up to market this monopoly product, has been charging. The present price of ordinary titanium dioxide powder (151 grade) is more than Rs. 50,000 per tonne.

The Industries Minister who is aware of such drawbacks of this industry which is considered as a "gold mine" of the State Government, has said unless something is done urgently, it would be in the same condition as the white cement factory at Kottayam (Travancore Cements Ltd. under the State Government management).

Mrs. Gouriamma denied having any knowledge of the reported proposal to amalgamate TTP and KMML or hand them over to the Government of India to salvage them. Some sources had said that such proposal made by the Bureau of Public Enterprises and the Kerala State Industrial Development Corporation have been hanging fire for long. She said she did not know whether there was any such proposal during the time of the previous government headed by the Congress(I).

It is understood from Mr. K.P.P. Nambiar, chairman of Keltron and advisor to the Kerala Government, who is the link between the Tatas and the State Government that Tatas have offered the necessary investment and the state of the art technology for the modernisation and expansion of the titanium industry either by setting up a totally new plant or by taking over the existing units. Among the existing units their inter
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AW MATERIALS

Producers may hike prices

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according to Mr. Sumati-
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Rs. 5,460 per tonne and HDPE by Rs. 4,000 per tonne, according to him.

Mr. Mehta fears that the total burden on the processing industry would go up by Rs. 450 to Rs. 500 crores as a result of increase in customs duties, and expected increase in prices by local producers along with its impact on excise duties, taxes and other levies.

"Such an unprecedented increase in burden will very badly affect about 20,000 small scale processors while handful of local producers of polymers will have a windfall of profits," he said. Mr. Mehta has urged the authorities to immediately withdraw the recent increase in import duties.

The All India Federation of Plastic Industries (AIFPI) has decried the hike in customs duty on import of polymers, arguing that it would "deal a serious blow" to the conversion industry, which meets 50 per cent of its requirements through imports.

In a press release, AIFPI said a large number of small units, which account for more than 90 per cent of the processing industry, would have to close down resulting in widespread unemployment.

Mr. Virendra Kumar, president, AIFPI, while asking the government to repeal the notification, stated that these duties had been based on international prices ruling in August 1989, which were $ 250 lower than the current prices.

OSWAL POLYETHYLENE UNIT GOES ON STREAM

The polyethylene plant of Abhey Oswal in Chembur Bombay (formerly owned by Union Carbide India Ltd.) commenced production on January 10.

The Chembur plant has an installed capacity to produce about 12,000 tonnes per year of low density polyethylene. The plant was closed down in 1985, following the Bhopal diaster.

The Carbide management refused to reopen the plant in the light of the Supreme Court judgement in the Shriram case, which proposed unlimited liability in case of an accident. The plant was acquired by the Oswal group last year.

The recommissioning of the plant was a herculean task because a lot of vintage equipment had rusted and had to be replaced, and getting replacement for the Carbide process plant was no easy job.

To top it all, utmost consideration had to be given to safety and environment protection as the plant is located on the outskirts of Bombay city. The new management had to spend more than Rs. 10 crores in retrofitting and installation of additional equipment.

The public sector Engineers India Ltd (EIL) has been closely associated with the new owners in recommissioning the naphtha cracker and the polyethylene plant, and will continue their association for some more time.

Oswals are already in the polyethylene market, having recommissioned the mothballed ex-ICI alcohol-based polyethylene plant in Rishra, West Bengal, last year. Despite their small scale of operations.

Oswal petrochemical operations are profitable. This is not only because of the wide gap in indigenous supply and demand, but the quality of material that the ICI and UC processes deliver.

Rs. 3,357 crores IOC turnover

The year 1988-89 was a year of achievements for Indian Oil's Southern region covering Andhra Pradesh, Karnataka, Kerala, Tamil Nadu and the Union Territory of Pondicherry, Mr. Ramgadia, IOC's General Manager, Southern region, said.

Addressing a press get-together at Trivandrum on January 11, Mr. Ramgadia said that not only had the Southern region achieved the highest ever sales turnover of Rs. 3,357 crores in 1988-89 compared to Rs. 3,144 crores in the previous year, but the net profit at Rs. 98 crores has gone up by 27.2 per cent as compared to Rs. 72 crores in 1987-88. The sales tax payments for the region from April to December 1989 were Rs. 318 crores.

During 1988-89, IOC sold 6.46 million metric tonnes of petroleum products in the southern region, achieving a percentage increase of 7.8 over the previous year. During the first half of the current financial year (April-September 1989) IOC sold 3.34 million MTs of petroleum products, recording a percentage growth of 5.7 over the same period last year, he said.

Talking about IOC in general, Mr. Ramgadia said, it was the largest commercial enterprise in India and was 11th among 52 petroleum companies outside the USA. It owns six of the nation's twelve refineries in India with 48 per cent of Indian crude oil refining capacity. IOC had a sales turnover of Rs. 15,343 crores and a profit of Rs. 676 crores (before tax) in 1988-89. It had declared a dividend of 20 per cent last year.

Mr. Ramgadia announced that the IOC would set up a new divisional office in Trivandrum soon to further improve its customer service and to cater to the rapidly increasing demand
for petroleum products. With
would have 11 divisional office
ing the one opened at Manga
November 1989, he said.

He said that the new division
and the State headquarters wou
the six southern districts of A
Kottayam, Idukki, Pathana
Quilon and Trivandrum. This w
only reduce the work load
Cochin divisional office w
present was co-ordinating the
and distribution of petroleum pro
throughout Kerala, but would als
itate better co-ordination with the
Government in the distribu
petroleum products, especially ke
In addition an Indane area office o
in Cochin in 1987 was exclusivel
ing after LPG marketing, he sa

Mr. Ramgadia said IOC was p
ing to increase its LPG bottling
ity by 45,000 metric tonnes per a
(mtpa) with the setting up of th
LPG bottling plants at Cochin,
and Vijayawada respectively
work has already begun on the
mtpa LPG bottling plant at Vija
the Cochin and Calicut plants of
mtpa and 10,000 mtpa capacity
be launched shortly and be r
production within 24 months, h

Mr. Ramgadia said the exist
bottling plants of IOC at Sa
Bangalore were already operatin
their full capacity of 37,500 mtp
Since IOC was the sole ma
agency for Madras Refineries L
bottling capacity: 84,000 mtpa), th
bottling capacity was likely to
204,000 mtpa with the commis
of the three new plants. Mr. Ra
said that during the year 1988-
has marketed 255,000 mts of
263 markets of southern
accounting for a market share of
cent. About 87,500 new Indane c
ers were enrolled. Between Ap
November last year 89,400 mo
enrolled bringing the total
Indane customers into 20.77

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IGH GAS LIFT PROJECT

Delay may cost dear

n finalisation of the con-
ombay High gas lift pro-
o cost the country dearly.
latest estimates, the delay
result in loss of crude oil
f between one to 1.5 mil-
rom the western offshore
ar, depending on the time
all the gas lift system.

tonnes of crude oil could
bout Rs. 100 crores in for-
ge at current prices. If the
re, the loss could be still
mpts are now being made
he production from certain
to partly meet the short-fall
ay High.

g to the original schedule
was to be completed by
1990. The letter of intent for
was issued to the Italian
aipem, which was to execute
e engineering backing of
tti. Both are subsidiaries of

the letter of intent was issued
t year, the company had not
e "kick off" meeting and pro-
h the work as it is disputing
ints in contract. ONGC has
to encash the bid bond of
ormal talks between the two
et to take place to sort out the

er, it looks as if there is going
neeting ground between the
rding to oil industry watch-
alian company may find it dif-
execute the project at the
d price as the market has since
The contract was valued at
s. 140 crores when it was

trolcum Ministry has asked the
o examine the possibility of
ng the contract. ONGC has
already started exploring from other companies as to how much time it would take for them to install the gas lift system if fresh tenders were invited. Though Saipem was a little more expensive than its nearest rival Essar, the Finance Ministry wanted the contract to go on to Saipem because of the $32 million soft credit offered by it to cover bulk of the foreign exchange component of the project valued at $37 million. The Italian credit has, however, not yet been made available, upsetting both Saipem and the Finance Ministry's calculations.

The scope of the project includes design, engineering, procurement, fabrication, load out, tie-down, transportation, hook-up testing and pre-commissioning of 40 pipeline segments totalling about 180 kms. It also covers extension of pipeline risers and installation of valves on well head and process platforms deck piping for exporting compressed gas to Gujarat.

TATAS WILL NOT BACK OUT FROM KARNAL REFINERY

Mr. D.S. Seth, Chairman, Tata Chemicals Ltd., has categorically reiterated that the house of Tata's commitment to the implementation of the Karnal Refinery project, remains firm and undiluted. Dispelling doubts in some quarters that the Tata interest in Haldia Petrochemicals may result in Tata Chemicals deciding to withdraw from Karnal Refinery project, Mr. Seth emphasised that there was no conflict whatsoever between the two projects. Mr. Seth, however, declined to comment on the possibility that, in view of the resource crunch and precarious balance-of-payment position, a mega project like the Karnal Refinery, involving large capital expenditure and current expenditure in foreign exchange, could well be deferred.

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Clearance for Haldia after IDBI okay

The Centre will take a final decision on the multi-crore Haldia Petrochemical project in a month or two in consultation with the Industrial Development Bank of India (IDBI). The clearance will be given after going into the structure of the project, tract record of the promoters and other details in consultation with the IDBI.

There has been an urgency injected into the clearance of the project with the National Front government assuming office at the Centre. West Bengal Chief Minister Mr. Jyoti Basu, who did not waste any time in taking up the issue with Prime Minister V.P. Singh himself, had had meetings with Petroleum Minister M. S. Gurupadaswamy on January 4. "The ball is in the court of the state government as it has to come up with its final proposal," official sources said. The basic concept of the project, which had not taken off even after a decade after its proposal, was that the naphtha cracker and the downstream units should be an integrated complex.

The state proposes to have more than one promoter as the cost of the project has gone up from the original Rs. 1,470 crore in 1979 to more than Rs. 3,000 crore. This is not only on account of cost escalation but also because of the new minimum economic size of the plant fixed at 300,000 tonnes of ethylene per annum from the original 100,000 tons.

The Haldia project which was envisaged with 54,000 tonnes of ethyene per annum in 1979 was modified to 100,000 tonnes in 1985 when R. P. Goenka came forward to participate as a promoter. However, the IDBI had objected to it on the ground that such huge financial assistance should not be given to one company and due to the funding and technical objections the project was delayed. In 1989, Basu met the Union Finance Minister and it was felt that there was need for a fresh
whole project. Accordingly a
headed by a joint secretary in
try of petrochemicals was se
representatives of finance
IDBI, GTPD and experts in th
September 1989. The commi
three meetings had referred th
to the IDBI when the state gov
came up with four alternati
committee had asked the state
up with a firm proposal after
ing the IDBI. Now the state
ment is evaluating the propos
the promoters and after final
promoters, it will come up wit
proposal soon. Since IDBI is
opinion that more than one prom
necessary for the clearance of
project, the state government is le
the choice of choosing its pr
—one or more groups, and the
will not interfere in this matter.

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instituted a Nobel talent search
for young scientists for their "ou
ing contributions" in the field o
ics, chemistry, biology and mathe
Dr. B.G. Sidharth, director of the
said recently.

The award, which carried a cas
of Rs. one lakh, would be give
1990. It would be monitored by a
comprising Dr. M. R. Srin
chairman, Atomic Energy Comm
Bombay, Prof. C. N. R. Rao, di
Indian Institute of Sciences, Ban
Prof. Narlikar, Director, Inter-Un
Centre for Astronomy and Astr
ics, Poona. Prof. M.S. Raghun
chairman, National Board for
Mathematics, Bombay, Prof C.
shadri, dean of school of mathe
Madras, Prof. Qasim, vice-cha
Jamia Millia Islamia, New Delh
Varadarajan, consultant, Pl
Commission, and Dr. P.M. Bh
director, Centre for Cellular and M
lar Biology, Hyderabad

-round improvement in ONGC operations

oil and gas production, ocarbon strikes and upgra- Krishna-Godavari, Cauv- am Arakan basins marked Natural Gas Commission's erations in 1989.

to official sources, oil pro- to 31.07 million tonnes in ering an increase of almost tonnes over 1988.

gas supplies by ONGC ncrease of 21.5 per cent over s year. Gas supplies were 13 new consumers in indus- as like chemicals, textiles, lizers and even tea planta- otal increase in terms of oil ivalent of gas was about 4.9 nes as compared to produc- 1988.

ne year, oil and gas strikes at eleven prospects, promi- g them being Natumilli, angalam, Lingala (southern oraghat (Assam) and Kutch

jor hydrocarbon discoveries southern region, which is an over ten-fold increase in in the Eighth Plan, as com- the Seventh.

on work was extended to nd North Bengal. The first centre structure in Mizoram and drilling taken up for ne at Karadighi in North

randum of understanding gned with British Petroleum ation in exploration work in ayan foothills and Ganga

age time required to put dis- production was gradually brought down. The discovery of Lingala in Krishna-Godavari basin was the fastest, with production commencing immediately after the strike was made.

A total of 41 structures have been put on early production system (EPS) and the contribution from these prospects is estimated to be about 1.5 million tonnes per annum.

ONGC also signed several agreements for exploration and consultancy services with international companies during the year. An agreement was concluded with the National Oil Company of Malaysia (Petronas) for two consultancy projects to be carried out at the Institute of Petroleum Exploration in Dehradun, and the Institute of Reservoir Studies in Ahmedabad.

Another consultancy agreement was signed with the National Oil Company of Thailand for exploration in the Gulf of Thailand. An agreement for conducting exploraiion in Malaysia was also signed.

MOROCCO TO GET $50m TO FIGHT OIL SLICK

King Fahd of Saudi Arabia has donated $50 million to Morocco to help fight the oil slick off its coasts, the Saudi press agency reported.

It quoted the King as saying he hoped clean-up efforts would succeed, after the Iranian oil tanker Kharg 5 spilled more than 200,000 tonnes of crude since December 19. The crippled Iranian tanker was turned away by Portugal, the third country to refuse entry to the ship.

A Portuguese navy boat escorted the Kharg 5 away from the Portuguese island of Madeira after the tanker entered its territorial waters there, the national news agency Lusa said.

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RAISING CRUDE OIL ROYALTY

Industry backs Gujarat's plea

Industry and trade have backed up the Gujarat government's demand that the Central government should raise the rate of royalty on crude oil for Gujarat to Rs. 683.50 per tonne with retrospective effect from April 1, 1987.

Voicing the state's demand at a news conference at Bombay, Mr. Dilip R. Parikh, president of the Gujarat Chamber of Commerce and Industry, said the Prime Minister's announcement of an interim relief of Rs. 100 per tonne in addition to the existing royalty rate of Rs. 190 per tonne "is highly inadequate" especially when the state's economy was experiencing considerable stresses and strains at this juncture. He also demanded that the royalty rates should be reviewed once in every two years as recommended by the Sarkaria Commission. Mr. Parikh also made out a strong case for supply of gas to industries in Gujarat at a special concessional rate. He said that "the benefit of low cost fuel found in Gujarat should be made available to the state, as in the case of Bihar, Maharashtra and Mysore." About pricing of gas, he said that a three-tier uniform pricing formula of natural gas, which came into force from March 31, 1987 (Rs. 1400 per 100 cmc for offshore gas, Rs. 2250 per 100 cmc along HBJ pipeline and Rs. 1000/500 for North-East States) has expired on March 31, 1989." The new formula which is being evolved by a committee of Bureau of Industrial Costs and Prices should be based on parity prices of coal at pithead on calorific value basis at Rs. 850 per 100 cmc.

Mr. Parikh also urged the government not to succumb to pressures by the so-called environmentalist lobbies in respect of the Sardar Sarovar project, which was the lifeline of Guj disruption in the Narmada da mentation would be un resisted by Gujarat's people. gestion that the heighs of th reduced was untenable, be would defeat the basic purpos its water to drought-prone dis Kutch. He urged the support of thinking people to the Narmad He strongly criticised the Ind ronmentalists, who went U.S. that government's support to s struction of the project.

CRL LAUNCHES IN-HOUSE R & D

The public sector Cochin Re Limited (CRL) has launched house research and developme gramme to further augment the mum utilisation of resources th short-term and long-term mea

The R & D programme has b cognised by the ministry of scie technology, and forms a part o ence and technology compone country's five-year plan. CRL h blished itself as one of the best units in the country and is ma forts to further improve its perfor The R and D effort is a step in rection. The R and D activities been so designed as to support an rove upon the functioning of th ing and future operating units in th nery to optimise production an rove productivity. Efforts are als made to achieve the maximum economy. The R & D centre wi uate, modify and adopt latest ogies wherever available, to su local needs. Linkages will also moted between various sectors fo mercial realisation of the resul R & D efforts. The centre will dertake elaborate research for tive and quantitative improvem finery products, production of micals and new feedstocks ma refinery streams and expen computer simulations of pro plant.

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PRINT-DESIGN

firms split over staying on

giants, Chevron Inter- nd Texaco are divided on of continuing their dia under the third round offshore oil exploration Chevron has decided to fter completing seismic nadi, its partner, Texaco, drill more wells in India.

ean that the joint venture e two companies for their ndia will have to be dis- ief executive of Chevron Bradley R. Jones, when d: "No comments".

ment has already received posal, the details of which n. But informed industry at the U.S. company has ll more wells in the Palar Godavari basins. Chev- to pull out, without exer- on to drill under the next contract, has surprised oil es because it is the only oil company which has ently showing interest in is comparatively new to

nd Texaco, which formed nture as equal partners, dry wells, one each in lavari and Palar. Together, our offshore concession in Krishna-Godavari and Mahanadi and Palar, under nd of bidding. They have ns for the remaining two s, they can pull out after survey without drilling any on has made it clear that it drilling in these blocks.

's proposal is accepted, it drill a minimum of one well k. Texaco's first preference basin. It is not clear as yet he two blocks in Krishna- will opt for. The Oil and Natural Gas Commission (ONGC) has been drilling in both Krishna-Godavari and Palar. It has struck oil and gas in both these basins. The drilling results from these basins must have been encouraging for Texaco.

Meanwhile, Shell, which is drilling in Kerala-Konkan, is expected to reach the target depth by the end of this month. It has got two blocks in Kerala-Konkan. It will drill one more well there. All other companies, which signed contracts under the third round of bidding are preparing to spud their first wells by March.

International oil industry circles are keenly awaiting the government decision on the next round of bidding. There has been no political decision as yet on the subject. However, the Ministry of Petroleum has been holding informal talks with international companies on the subject. The plan is not to go in for a global tender but negotiate individually. A number of companies including Chevron have shown interest in the next round of bidding, say oil industry sources.

ONGC ACQUIRES FOREIGN PATENTS FOR NEW DEVICE

The Oil and Natural Gas Commission has won a British and French patent for its invention of the sub-surface pressure gauge, against stiff international competition. ONGC sources say that it won the patents while competing with multinational giants like Schlumberger, Hewlett Packard, Lynbes and Leuterts, all companies which have over two decades of worldwide experience in manufacturing and marketing such devices.

The sources said the electronic gauge could work upto 2,000 hours, as against the 200 hours by the same type of gauge presently available. The gauge can be manufactured indigenously for Rs. 3,000 as against imported electronic clocks costing about Rs. 2.5 lakhs (a set of 12 mechanical clocks). The savings in foreign exchange, ONGC sources claimed, would be of the order of Rs. 8 crores. ONGC has awarded the marketing rights to George and Nicks Inc. of Canada, which expects to sell about a thousand instruments for $3,000 a piece yearly. The US, West Germany and Canada are also likely to acquire the patent shortly, the sources said.

Earlier, one of ONGC's inventions, the photoinclinometer (a device used for measuring the direction of the well) was patented in nine countries including USA, Germany, Italy, France, Switzerland and the United Kingdom. The system has been licensed to a Canadian firm. The firm is presently engaged in devising a commercial version of ONGC's patent, the sources said.

Field trials in Canada, USA, and Britain are scheduled during early 1990. The sale price of this unit is $50,000 each, over which royalty is payable to ONGC on the same terms, the sources said.

OIL FIRMS IN UGANDA THREATEN TO CLOSE DOWN

Oil companies operating in Uganda have threatened to close down their operations following the Government's refusal to raise the dealers' profit margin on petroleum products, the Energy Ministry sources said recently. The only six oil companies operating in the country and which are all foreign-based —AGIP, Shell, Caltex, Total, Esso and Upet — have said that the operating margin offered to them is too small to sustain their business operations. They pointed out that following a further devaluation of the Ugandan shilling, the former 4.90-shilling margin per litre offered to them by Government-controlled prices had been wiped out. The sources explained that for every litre sold, the oil companies lose 10 Uganda cents.

Company notes

RAMA PETROCHEMICALS LTD.

Rama Petrochemicals Limited has reported improved performance for the six month period ended 31st October 1989. The relevant particulars for the six month period ended 31st October, 1989 and the figures for the corresponding period of the previous year are summarised in the table below.

The company has been able to achieve a better result during the six month period ended 31st October, 1989 compared to that of the corresponding six months of the previous year due to reduction in the consumption of raw material, savings in energy consumption and also partly due to the discontinuance of the price pooling system.

The company is hopeful of ending he current financial year with much improved performance compared to the profit for the thirteen month period ended 30th April 1989.

GUJARAT GLASS TO ISSUE CAPITAL

Gujarat Glass Ltd., a company belonging to the Piramal group, headed by Ajay G. Piramal, recently conducted a "ground breaking ceremony" at Kosamba, near Surat, for setting up of a 130 TPD sodalime glass bottle manufacturing plant. The plant is expected to go on stream by December 1990, thus doubling the capacity of sodalime bottles from the current 65 TPD.

Gujarat Glass is the only company in India manufacturing both sodalime and borosilicate glass, catering primarily to the pharmaceutical industry. The company's expected turnover for the year ending March 1990 is Rs. 20 crores. Subsequent to the expansion of its capacity, in a full year's working, its turnover is expected to touch Rs. 40 crores.

The company has recently entered into a technical know-how agreement with PLM Consulting International B V of the Netherlands for technical assistance for the manufacture of glass bottles and vials. The company would benefit not only in relation to its existing operation but also in relation to expansion of its capacity, where PLM would assist them in setting up a sophisticated glass manufacturing plant. The project cost for this expansion is around Rs. 19 crores. The company would enter the capital market in early February this year to finance a part of its expansion.

Particulars	Half year ended 31.10.89 Rs. in lacs	7 month period ended 31.10.88 Rs. in lacs	Percentage increase	Financial year ended 30.4.89 (13 months) Rs. in lacs
Gross Turnover	2149.16	2034.47	5.64	4270.55
Operating Profit	528.94	500.93	5.59	1014.85
Interest Charges	165.00	186.59	-	356.90
Gross Profit	363.94	314.34	15.78	657.95
Provision for Depreciation	177.75	184.80	-	355.45
Profit Before Tax	186.19	129.54	43.73	302.50
Provision for Taxation	-	-	-	-
Net Profit (After Depreciation and Taxation)	186.19	129.54	43.73	302.50

GUJARAT INJECT

Gujarat Inject has secured
orders for exports from Afgh
Nigeria and Sri Lanka and exp
export 25% of the expanded capa
the end of the year. The compa
decided not only to expand its p
tion capacity on the existing line
fluids but has progressed toward
sification in bulk drugs and fo
tions. It has signed an agreement
foreign collaborator to market it
duct in tablet form. The drug pa
by them is to be used by patients
ing from kidney failure. This will
troduced in India for the first tim
will save patients from a lot of ex
& keep them away from hospitals

The company has employed t
cal and marketing expertise for the
and is likely to go on stream in the
future. The turnover of the compa
likely to cross over Rs. 40 crores
next 12 months, when two of the
sector projects which are under i
mentation in Kerala and Rajastha
into production. The company also
poses to set up a plant to manufa
disposable intravenous administra
sets and other medical equipments
orders for the machineries have al
been placed and production will
mence soon. With this, the com
will be full fledged in supplyin
latest disposable medical equip
under one banner.

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dyes etc. is making a bonus issue i
portion of 1:1 to its shareholders
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pany proposes to make an issue
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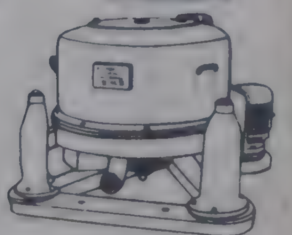

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iotechnology & Life Sciences (Part 2)

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UES, FOOD CONTAM-
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td. a newly formed biotech
sed in York, UK, aims to
nostic kits for use in detect-
l residues, food contami-
vironmental pollutants, and
unique biological bar code
ng trace levels of specific
which have been added to
ch as drugs.

npany is a wholly-owned
of the Royal Dutch/Shell,
company's technology is
e research work of the bio-
sion of Microtest Research
rk (UK), which has been
Biocode and on the patents
h work of Shell Research-
oratories at Sittingbourne.

is already marketing toxin
through Oxoid, a Unilever
Biocode Ltd. is based at
Road, Heslington, York,
UK. (*Animal Pharm*,
. 9)

HING OF GOLD &
OISED FOR GROWTH
DA & FRANCE

Resources, Canada, is the
ny in the world to commer-
act gold and silver by bio-
f the ores. It is the first
operate 'Biotankleach' of
size for bacterial leaching
d silver ores.

organism of the bioleaching
llus ferroxidans, which is the
in bioleaching of metallic
urs naturally in soils, thrives
on sulphide minerals, and is harmless to the environment. Researchers at Giant Bay Resources have patented a mixed bacterial culture containing a variety of microorganisms besides Thiobacillus ferroxidans. Commercial bioleaching operation employ these microorganisms in an unitized operation, such as stirred tank reactors.

Recent advances in France will make possible the extraction of gold from low sulfide ores. In France bacteria extract the precious metal from puddled metallic sulfides in experimental reactors. This is the new solution offered by the French Office of Geological & Mining Research to recover gold from depleted reserves and exploiting low gold containing deposits, instead of burning the sulphides in furnaces, which is a very polluting process, as it releases arsenic to the environment.

In contrast bacterial work by oxidation and extract 3 gm of gold from 100 kg. of sulfide ore per day. This yield is double that of the conventional extraction process. (*PTI Science Service*)

PROTEIN SEQUENCING BOOSTED BY A FACTOR OF 100

Spectrometry research work by two groups of researchers has resulted in the development of new protein sequencers. The new instrument can carry out amino acid sequencing upto 100-times faster than other methods.

The advantage of (using tandem) mass spectrometry is that researchers work with proteins, the way they are, not chemically altered', says Dr. Alma Burlingame, Director of Mass Spectrometry Lab. at Univ. of California (San Francisco).

Burlingame led the team that developed one of the instruments. In addition to being faster, the method is more accurate and requires less purification of samples. A second group led by Klans Biemann at the MIT, has put together a similar instrument.

Initial efforts to apply tandem mass spectrometry to protein sequencing used only single-channel detectors and required large sample amounts. But the California and MIT researchers got around this by using multi-channel detectors, which greatly increased sensitivity.

The detector on the Univ. of California instrument reads the spectrum of masses in about 3 to 4 min. significantly faster than the more conventional Micro-Edman process.

The primary obstacle to the new technique is cost -- the Canadian mass spectrometry method is about 10 times more expensive than the Micro-Edman process. But 'if you looked at the cost per amino acid -- the two techniques would work out to be about the same' Burlingame says. (*R & D*, 7/1989, p. 22-24)

CHEMICALLY MODIFIED PROTEIN CLEAVES DNA

By attaching a 1,10 phenanthioline-copper complex to a DNA - binding protein researchers from the Univ. of California (Los Angeles) have transformed the protein into a reagent for cleaving DNA at specific sites. Because DNA-binding proteins recognize stretches of DNA about 20 base pairs long nucleases derived from them could be used to isolate long fragments for sequencing or chromosomal mapping suggest researchers of the Molecular Biology Institute at UCLA.

The scientists first modified the lysyl residues of the tryptophan gene repressor of E. Coli with iminothiolane. The remaining sulfhydryl groups then were alkylated with a phenanthioline derivative that can form copper complexes.

Once bound to DNA, the coordination complex in its cuprous form joins with hydrogen peroxide generated insitu to oxidatively attack the DNA at a deoxyribose. (*Science*, 237, 1197 (1987) & *C & EN*, 9/7/89, p. 30)

MICROALGA FARMS CAN COMBAT CARBON DIOXIDE EMISSION AND GREENHOUSE EFFECT

Scientists are finding that microalga farms can help minimise CO_2 emissions and combat the greenhouse effect.

Researchers at Solar Energy Research Institute (Boulder, CO) say that microalga organisms consume CO_2 up to 20 times faster than conventional crop plants per unit of land area. The microalga then can be converted to liquid fuel or as used as a source for oyster food, pharmaceutical and pigments.

Dr. Lewis Brown, SERI project leader, says that trapping CO_2 in micro-alga treated flue gas filters at coal plants and burning microalga-derived fuel will cut net CO_2 emissions in half because we are burning it twice.

He estimates that installing microalga farms on 1% of the arid land in Arizona and New Mexico would provide a full product ammounting to about 6% of the total US petroleum needs.

'Our calculations show such a system would consume 160 million kg of CO_2 annually, which equals 3.2% of the total US CO_2 emissions'.

SERI scientists are conducting experiments on 2.25 acre microalgae ponds in Roswell, New Mexico. 'We have a fairly extensive collection of 1,500 organisms and we are focussing on the 10 best', Brown says. "We are doing genetic research and introducing DNA genes to enhance their properties' he adds. 'We are working to clone some genes for lipid accumulation' for improved biomass-to-liquid fuel performance. (*R & D*, 7/1989, p. 28)

BIONET DATABANK OFFERS SERVICES TO BIOTECH INDUSTRIES AND FINANCIAL INVESTORS

In response to a shift in the biotechnology industry from 'being research driven to being more market oriented' Steven Delco, President of Delco Scientific Resources (Fairfield CT), he has developed the Bionet Databank to match (or bring together biotech companies and potential financial backers.

Delco predicts biotech sales will hit $20 billion by the year 2000 AD though the number of companies involved will shrink considerably from the current 6000. Bionet will give investment companies information on biotech firms and their research products, and will supply the biotech firms with data on sources of capital -- including the government and merger, joint venture and acquisition opportunities. (*Chem Wk*, 11/15/89, p. 60)

BACTERIA CUT THE COST OF CLEANING UP PCBs

Canadian reserchers will soon start trials of a new method of destroying polychlorinated biphenyls (PCBs) using a 'cocktail' of microbes. Researchers at the National Institute of Scientific Research (near Montreal), have created a mixture of 25 bacteria that can destroy entire molecules of many of these pollutants at one-fiftieth of the cost of conventional treatments.

Provided the cocktail works as well in the field as it does in the laboratory, a commercial version of the process should be available in a few years time. PCBs leach into the soil around waste dumps, contaminating the ea
water. At present the main m
cleaning up PCBs involves bu
soil -- a procedure which is
provided that the incinerato
enough to burn the compou
pletely. But it is expensive, ea
ment costs Canadian $2000 (£
tonne of soil. Canada has at
polluted sites with 90000 tonn
awaiting processing.

Alternatively, chemical meth
extract PCBs. These technique
rely on solvents and surfac
cheaper than incineration but th
an additional, although less h
waste.

If the new microbial proce
development works, the cost to c
the contaminated soil could fal
as $40 a tonne.

The Canadian researchers
with strains of bacteria that they
from the soils near sites whe
were stored. These bacteria, wh
collected in large numbers, were
breaking down a variety of chlo
biphenyls, but very slowly.

The researchers at the
adapted these microorganisms
on PCBs more efficiently. In o
do this they used conventional b
techniques and genetic enginee

Spraying the cocktail into th
ronment would not be practical
researchers. PCBs which are oil
etrate deeply into the soil and th
teria would have to be well m
work effectively.

As an alternative to sprayi
researchers are considering wash
soil with surfactants to extr
PCBs, then treating the resultin
in aerated lagoons.

In the laboratory, the cockta
down either partially or comple
two most common PCBs in

r 1242 and achlor 1254.
a have to survive in suf-
numbers to be effective
The Canadians want to
bes that will digest achlor
t highly chlorinated PCB
difficult to destroy.

ians are not alone in their
ntists at General Electric's
esearch and Development
t Schenectady, New York,
al from the U.S. Environ-
tection Agency to test
ı outdoors on a highly pol-
Woods Pond, Massachu-
owerful strain, which needs
nditions and with the addi-
nts, can attack even achlor
Scientist, 10/7/89, p. 34)

ENZYME BAFFLES
TS

enzyme that rots wood once
or countries a better way of
eed for livestock from straw
y-products of crops. Five
scientists are still baffled by
zyme works.

e-rot fungus Pharnerochaete
um, makes an enzyme called
The enzyme breaks down
uilding block of wood. Once
molecules of cellulose and
ose, rich in energy become
o the fungus.

y, researcher Pat Harvey at
College, London (UK) has
the enzyme is ineffective on
xed with lignin, it either does
begins to work on the phen-
groups in the lignin.

has released enough of the
oimers, however, it begins to
eir polymerisation back into
s is a circular and useless abil-
e point of view of a cow that
et at the cellulose in the straw.

ngus prevents this feedback inhibition in some way. Mixed with the fungus, the enzyme breaks down the lignin, suggesting that the fungus provides the enzyme with either the microenvironment or the co-factors that it needs to work. Unfortunately, the fungus is of no use on its own because it destroys the cellulose as well as the lignin, leaving the cows with an even poorer quality feed. (*New Science*, 10/14/89, p. 32)

A TOXIC AMINO ACID IN FALSE SAGO PLANT LINKED TO GUAM DISEASE

A rare amino acid called L-α-amino -methylaminopropionic acid (MeDAP) has been linked by recent research as the cause of Guam's disease. Guam's disease is a neurological disease causing degeneration of brain and spinal cord; leading to dementia, paralysis and death.

The nut of the false sago plant has one deadly component, that is not found on proteins, called L-α-amino-β-methylaminopropionic acid (MeDAP). Recently researchers at the Albert Einstein College of Medicine (New York) have shown conclusively that Guam's disease is caused by a diet containing MeDAP.

The mechanism of action of MeDAP was recently elucidated by the research group of Ledie Pettit of the Univ. of Leeds (UK). These researchers found that the toxin MeDAP is an avid scavenger of the essential minerals Cu and Zn. These metals are normally present; complexed with glutamic acid in the central nervous system.

Chemists generally regard these complexes as being very stable. They have shown that MeDAP can wrest Cu and Zn away from the glutamic acid and bind the metals to itself more strongly. A lot of MeDAP in the diet or a small intake over many years could deactivate enough of these essential metals to cause permanent damage to nerves. (*New Science*, 10/7/89, p. 31)

BIOTOXINS FROM MYCOGEN TO BE PATENTED

Mycogen Corporation's scientists have discovered novel strains of the bacteria Bacillus thuringiensis (Bt) that are toxic to plant parasitic nematodes. Mycogen researchers have developed a test that is capable of identifying Bt biotoxins effective against these pests. Patents have been filed covering the discoveries.

The biotoxins discovered by Micogen researchers will most likely reach commercial markets in plants genetically engineered to be resistant to the pests. Plant parasitic nematode control represents a potentially significant market with a clear need for alternative technologies. A recent survey by the Society of Nematologists found plant parasitic nematode damage exceeds $77 billion annually.

The most common control measures for plant parasitic nematodes are traditional plant breeding and chemical nematicides. However, traditional methods of breeding nematicide-resistant plants involve long and complicated processes.

Chemical nematicides can be toxic to mammals and other wild life and have been implicated in groundwater contamination. In addition, nematodes have built up resistance to many chemical nematicides.

According to researchers biological nematicides promise to overcome the disadvantages of synthetics while revolutionizing selective breeding techniques. The company is promising a collaboration with a company that has strong plant genetic engineering technology.

Earlier this year Mycogen researchers developed several novel strains Bt toxic to parasitic nematodes in livestock. This was the first evidence that Bt toxins have animal health applications. (*CMR*, 9/18/89, p. 35).

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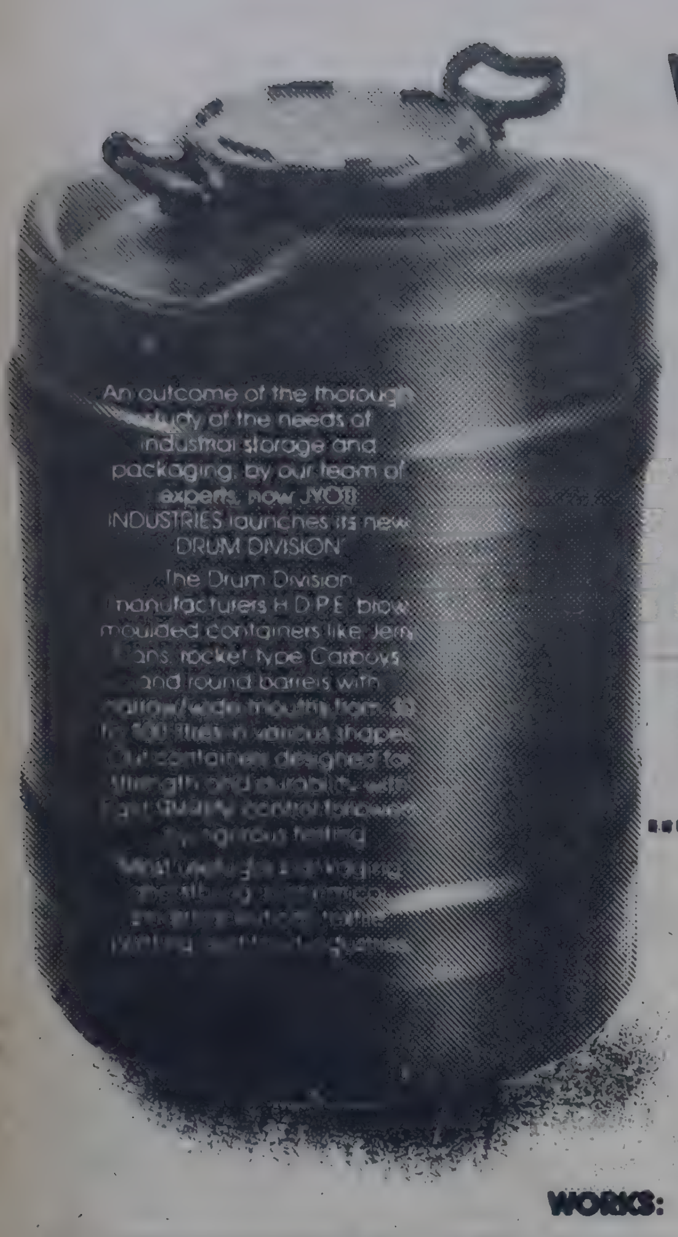

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ood & Pharmaceutical Technology in Perspective (Part 2)

E AQUACULTURE N PERSPECTIVE

e or fish-farming is of cance in world's food m its modest beginnings , aquaculture has today stest growing sector of the the world over. By all global aquaculture indusg. It is one of the fastest s in the food industry even he fastest expanding area ntuan US agriculture.

aquaculture production of staceans and molluscs rose mated 6.6 million tons in ut 10 million tons in 1988, of over 50% in 8 years. By e world aquaculture indus- to harvest over 21 million nting a 100% increase over ut. It is estimated that one- e world's consumption of e year 2000 A.D. will come lture. The tiger prawn, the crustacean sea food grown ure will offer an envious profits on an international

aculture industry in Asian already enormous in real- e. There are an estimated 8 ctares in production for aculture activities in Asia. an nations including India, sible for producing about world's aquaculture pro- leading Asian countries in are Japan, Korea, Taiwan, nd Malaysia. The aquacul- y in Japan, Taiwan and Thai- d increase much faster than loping nations such as China because consumer's diets in developed countries are still from grains to meats. How- o the enormity of the potential for aquaculture in China and India these countries could prove to be a most important market for long term growth of fish farming products.

Behind Asia, Western Europe represents the second largest aquaculture industry. Much of the European aquaculture industry is in mollusc production, but for the future growth it will be the trout and salmon fish-farming that are most significant. Western Europe has some of the most advanced intensive fish farming operations in the world, particularly for salmon and trout farming (which is dominated by Norway).

The Latin American, African and Eastern European aquaculture industries are relatively smaller in stature at present but are poised for exceptional growth in the near future.

This worldwide explosive growth in aquaculture offers enormous opportunities in future to producers of feeds; feed additives, drugs, vaccines, diagnostics and growth hormones. Feed is a high value item in aquaculture, and top prices are paid for premium products. Fish itself has a higher value item/lb than most other livestock and many aquaculture producers are willing to invest more money/fish lb on better quality feeds than other animal producers. This is especially true in the USA, Western Europe and Japan. By 1990 A.D, the worldwide aquaculture feed market is expected to exceed 4.3 million tons and be worth over 21 billion dollars. The market is expected to triple in the 1990s, with sales of over 14 million by 2000 A.D.

Although, India is also making progress in aquaculture, one wonders whether there is any awareness in India about the development of feeds for fish farmings and the enormous opportunities awaiting the export of feed for aquacuture to neighbouring countries. (*ECN, 9/18/89 p. 18-27*).

AQUACULTURE OPENS UP NEW OPPORTUNITIES TO PRODUCERS OF FEEDS, FEED ADDITIVES, DRUGS, DIAGNOSTICS, VACCINES AND GROWTH HORMONES

The explosive growth in world aquaculture has created in recent years a new vista of opportunities in feed, chemical, pharmaceutical and other related fields.

By all accounts the global aquaculture industry is booming. It is one of the fastest growing areas in the food industry and the fastest expanding area in U.S. agriculture. It is estimated that one-quarter of the world's consumption of seafood in the year 2000 A.D. will come from aquaculture (fish farming) amounting to over 21 million tonnes per annum.

These statistics translate into burgeoning feed market, which has risen from an established 1.7 million tonnes in 1980 to over 3.6 million tonnes in 1986. Asia and Oceania assume almost half of the market with those of the other half going to farmers in West Europe and USA. By 1990, the worldwide aquaculture feed market is expected to exceed 4.3 million tonnes and be worth over $21 billion. The market is expected to triple in the 1990s with sales of over 14 million tonnes by 2000 A.D.

Expansion in aquaculture clearly depend on the availability of better feed. Major areas within the aquaculture feed industry include markets for fish meal, soybean substitutes, fish pigmentation, delivery systems, vitamins and minerals, in-feed medications such as antibiotics, and a range of several feed ingredients and additives.

An increasing number of animal feeds firms in affluent countries, not traditionally involved in aquaculture feeds, are now realizing the tremendous opportunities in this area. Vertical operations that include their own R & D and production of aquaculture feed, the management of fish farms and even fish processing plants are becoming more common as businesses take advantage of the profits available in all levels of the aquaculture industry.

The industry is luring such diverse investors as chemicals, food, tobacco, public utility, oil, insurance, construction, pharmaceutical, biotechnology and crop agriculture firms. Although investors are entering the industry, the markets are still very open, particularly internationally.

The agriculture industry in Asian countries is enormous. There are an estimated 8 million hectares in production for coastal aquaculture activities in Asia. Some 16 Asian nations are responsible for producing about 79% of the world's aquaculture products and therefore offer an attractive export market for aquaculture feeds.

Aquaculture feed manufacturing in most Asian nations has been severely restricted because of the lack of capital and technological know-how. This is particularly true for China and India. Such areas are, therefore, likely to rely heavily on imports of aquaculture feeds, and joint ventures with foreign firms, to satisfy their domestic markets.

The majority of aquaculture producers in developing nations use farm by-products and pond algae to feed their fish and shellfish. It will take substantial marketing efforts to convince them that the use of costlier commercial pre-mixed aquaculture feeds result in higher productivity and better profits.

Western Europe (EEC countries) also offers the second largest aquaculture feed market after Asia. The trout and salmon markets are the most important to aquaculture feed manufacturers. Europe has some of the most advanced intensive operations in the world, and the demand for the highest quality feeds is unparalleled. Salmon and trout farming is dominated by Norway.

Business opportunities are exceptional in the rapidly expanding North American feed market, particularly for E.E.C. countries for the export of aquaculture feeds.

Two new areas for development in aquaculture are 'therapeutics' and 'diagnostics'. Aquaculture production can easily be jeopardized by disease, especially in intensive systems where, just like in livestock and poultry production, crowding is both a source of stress and can facilitate the spread of infection. Aquaculture producers undergo major economic losses due to disease.

More and more veterinary drug companies and pharmaceutical concerns are turning their attention toward the development of aquaculture therepeutics to meet growing demand. The presence of disease may be the most prohibiting factor in the growth of aquaculture worldwide. Tremendous opportunities are foreseen to feed and pharmaceutical companies investing in the R & D of the feed and water applied medications for aquaculture.

Leading authorities in livestock and poultry feed additives see aquaculture as the next wave of growth in the industry. The feed and pharmaceutical firms who are already involved in developing and producing feed additives for livestock and poultry are in a good position to transfer technology to the aquaculture sector. While traditional markets are growing moderately, aquaculture can provide the key to boosting sales.

The principle drawback to registration of aquaculture drugs and accessories has been the lack of major species in aquaculture as compare
mammalian livestock. Howev
that aquaculture farming has
such an important economic fo
global food sector, a great amo
& D activity is beginning amon
competing to capture their own
the aquaculture therapeutics m

Fish farmers also need reage
would allow for the rapid diag
diseases. Effective on-site diag
tests are badly needed to detec
ses at their earliest stage. Over
panies are involved in aqua
diagnostics in advanced countr

Antibiotics, in recent years hav
increasingly used in aquaculture
trol the diseases. The antibiotic
monly given to fish include
trimethoprim, furazolidone,
cycline and oxolinic acid.
microbes can develop resistanc
same way as mammalian orga
This resistance is transferred
quently to human pathogens. Th
lead to government restrictions
use of antibiotics in aquacultur

One way around the problem o
biotics could be through the use o
cines. Vaccines will become an in
part of aquaculture in the near
There are still dozens of major
ses for which vaccines are
needed. For example in Scandi
80% of the salmon and trout hav
vaccinated in 1988.

In-feed medications is another
tant area for aquaculture feed ma
turers. Aquaculture farmers
use a premix cocktail of ingredien
includes vitamins, trace elemen
erals, amino acids and medica
add to aquaculture feed.

Some products also contain
tite stimulant to promote feeding
ications that are actrive against
range of gram-negative organis
sing bacterial diseases of farm
crustaceans are especially

panies in USA and Japan
ing to grow algae in quan-
ough to market as natural
feed additives. In one
. researchers are trying to
produce salmon's pink
r than through chemicals.

of growth hormone is
ent factor in aquaculture.
too early to say with any
w much impact the use of
enhance growth will have
re, the potential advantages
mous.

fish may keep eating and
ring the winter months when
l fish are dormant. If so, the
ration might allow aquacul-
s to shorten the time it takes
full grown fish. (*ECN*,
18-30)

N POISED FOR
I IN PHARMACEUTI-
SMETICS AND DENTIS-

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n is a common name for all
partially deacetylated chitin
stituent in the shell of crus-
While the final product is sol-
k acids. Industrial production
n started in Japan around
side Japan, industrial volumes
manufactured in USA and
and development is going on
other countries. As a deriv-
hitin, the raw material situa-
itosan production is seen as
tin is the most plentiful bio-
ext to cellulose.

ety of applications has been
and tested with chitosan in re-
s. The Table 1 below gives a
view of the major applicatios
ic and pharmaceutical fields,
with salient functions of chit-
day the term chitosan is used
non name for all forms of par-
etylated chitin, where the final
s soluble in weak acids.

Table 1

Major Cosmetic/Pharmaceutical Applications of Chitosan on the horizon

Applications	**Functions**
1. Immobilise enzymes/living cells	Gel immobilisation matrix increase stability, compatible with phosphates.
2. *Personal Care Products*	
Hair care	Substantive to hair and skin.
Skin care	Form clear protective coating, moisture retention.
Viscosifier	Build viscosity in amphoteric/non-ionic shampoos.
Cosmetics	Viscosity building, coating, moisture retention, non-allergenic.
3. *Biomedical*	
Lower Cholesterol	Anti-cholesteric
Wound care	Accelerate wound healing
Eye bandages	Forms tough protective coating, biodegradable.
Drug delivery	Bioerodable, non-toxic.
Contact lens	Cross linked to give porous grindable lens material, non-allergenic.
Dental	Bio-adhesive.
Absorbable sutures	Biodegradable, accelerate wound-healing.
Orthopaedic	Temporary bio-engineering material.
4. *Biotechnology*	
Immobilised enzyme	Complexes with proteins.
Immobilised living cells	Forms gel matrix (e.g. beads).
Encapsulate cells	Replace polysine in algin bead process.
Filtration	Membranes can be cast; film.
Recover valuable protein	Complexes with protein flocculate.
Chromatography	Support enzymes/cells stabilisers.

Quite a large number of derivatives of chitin and chitosan have also been proposed and prepared by several laboratories in USA and Japan. Retaining the properties of chitosan in a solution of neutral pH is one of the objectives of making derivatives, another is to improve or combine new effects with the existing properties.

Even though the solubility of chitosan is limited to an acid environment, the acid solution of chitosan has many interesting properties. In acid solution chitosan behaves as a pseudoplastic material.

The main application of chitosan in cosmetics has been so far in haircare, with many shampoos and conditioners containing the product already for sale in Japan, USA and Europe.

The advantage of using chitosan in such products is further based on its ability to form films with proteins. Compared with synthetic polymers, the chitosan film is more stable at high humidity, having a lower tendency to adhere.

It has further been found that hair treated with chitosan is less statically charged during brushing and combing than hair treated with traditional hair fixers. Another important aspect is that chitosan does not contain harmful monomers from any polymerisation step and is regarded as physiologically safe.

Other applications where development work is going on with new products expected to be released in the market abroad soon are:

- * Encapsulation of fragrance, pigments and active ingredients.
- * Special grades of lotions.
- * Humectants.
- * Dental products for cavities protection and wound healing.

The most potential pharmaceutical applications will be in wound-healing formulations, eye care products and drug-delivery systems. Related to cosmetics the wound healing/synthetic skin applications will probably be the closest to marketing.

The haemostatic effect of chitosan is explained as a crosslinking/re-polymerisation reaction between the membrane of the red-blood cells and chitosan. Applied on dressings or by chitosan coating of vascular grafts in surgery, this effect has been tested out emperically.

Interesting areas of potential, where chitosan can have a combin tic/pharmaceutical role, incl ducts like after-shave lotions, a for treatment of damaged skin etc. (*Mfg. Chemist*, 10/1989, p

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TOPNAGS

survey in Chemical Industry — Problems and Limitations

N.S. VENKATARAMAN
sultant, Nandini Consultancy Centre, M-60/1, IV Cross Street, Besant Nagar, Madras 600 090.

ficult aspect in taking investment decision with hemical projects appears to be the assessment entials for chemical products in the country. has become particularly difficult, since orgaand upto date information and data are not read-ven established consultant organisations with ground and facilities, find it extremely diffie quick and reliable assessment of the market tion for the chemicals. It is sad that even the r the chemicals cannot be obtained readily. A publish every week the import details of chem-adras and Bombay ports. They appear to colons from the import bulletins made available ay and Madras ports. In the case of other ports , Vizag, Cochin, such import data are not readfor the benefit of the industries. There is also publication of import details of chemicals trans-. The authoritative import data on chemicals by ent sources are published atleast 12 to 14 months rts. One can understand the plight of those seekthe supply situation in the country for products mstances. Normally, the market assessment for d other products are carried out in three phases ratory desk research, contact programme by corand personal interview with the traders, conproducers. After the collection of all this in an organised manner, they are subjected to evaluation to reach conclusions and quantify the ply figures.

ratory desk research can be carried out effectively ty levels, only if one keeps track of the developmical industries for a length of time. It is imperinformation made available by experts in chemis from various functions from time to time, colept in a systematic way in a well documented asy access to vital information, should be availght time, to those seeking to do a market study. l as to whether any such product based docund information, in the field of chemical industry l products with regard to various aspects, are adentained by any library or agency in the country. erally available is the volumes of a few chems which are bound and kept in the shelves from . In such situations, the exploratory desk research e demand-supply situation for chemical products very difficult, time consuming and a frustrating The available information is also not often foolral instances can readily be cited, when two difals provide two different information on the same he assessment provided by the Government of India and DGTD on future demands for products are also often proved to be very unreliable. For example, the official estimates for octanol demand in the country in 1990-91 is 35,000 tons; but actually the imports of octanol in the country in the entire 1989 from the published data, appears to be just around 1000 tons; with the indigenous production being only 10,000 tons. Many other examples can be cited. It is the general experience of market survey consultants that when they approach the producers, consumers or traders in chemical industries for information, there is tremendous level of reluctance on their part to provide vital information and statistics. When thousand letters are sent seeking information, one should be lucky to get more than 70 to 80 replies. This is no exaggeration. Even for personal interviews, many organisations and persons extend little cooperation. Under such circumstances, the market survey agencies are forced to adopt clandestine methods and techniques to get information from organisations, with regard to the consumption details and future requirements for products. A market survey specialist has to be not only an expert with regard to the chemical industry scenario, but also should have expert PR qualities and personal charisma to collect information.

A good market survey assignment would be more reliable if it were not to restrict itself to mere collection of figures. It should seek to establish the relevant and important factors namely the feasibility of the product becoming obsolete, the relevance of the product to the country's economic and industrial development, availability of the optimum technology to produce products at competitive price, the nature of trading practices adopted and the 'cultural segment' in which the product would fall. A mere assessment of the present gap in the supply situation by itself cannot provide adequate guidelines, in the absence of the above information. The assessment of demand potentials for chemicals have become such a highly complex job that the persons concerned with the investigation require exposure to process management, technology assessment, product applications, sales promotion and managerial judgement. In Indian conditions, where statistics are only partly reliable and multi various factors affect the situation, it would be unsafe for the market survey agencies to attempt to quantify the demand potentials and supply gap for any chemical in precise terms. Such an attempt would lead to undermine the credibility of the work carried out. A definite indication of the relevance of the product to the country's growth pattern and the trend of demand potentials should be considered adequate in such circumstances. This should be considered as a more honest approach, than demanding that the market survey consultants should indicate precise figures of growth, ignoring the constraint and limitations facing them.

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iotransformations: the challenge and the rewards

ANNE-MARIA BRENNAN
Durrell Institute of Conservation and Ecology, University of Kent, Canterbury.

ıpsurge of commercial interest in the potential
stems to achieve highly specific chemical reac-
e success of results so far gained from research
ent in protein sciences, genetic engineering and
Biotransformations, as they are now known, are
ew opportunities in areas ranging from chem-
euticals and the treatment of waste to food and
ıst how valuable the rewards of future research
is evinced by a programme funded equally from
ent sources on the one hand and on the other
jor companies, up to a total of £4 million. The
already underway with the setting up of a £1
Jniversity Biotransformations Research Centre.

rmation systems can achieve many ends, pro-
chemicals with highly defined structure and a
ity that cannot be attained by more traditional
some ways they are an answer to the alche-
, converting cheap materials into highly valued
e area of research is exciting and challenging,
able potential for the shaping of synthetic chem-

tance attached to this field can be gauged by
e programme involving the scientific commun-
try, funded jointly to the tune of £4 million by
rtment of Trade and Industry and the Science
ing Research Council on the part of the Gov-
by industry itself, public and private support
on a fifty-fifty basis. It is one of many such
across the broad field of science and techno-
what is known as the LINK initiative, which
advances in science and engineering with par-
ercial promise and is intended to stimulate col-
tween industrial and science-based partners in

in the programme has been to set up an Inter-
iotransformations Centre. The word Centre in
t used in the sense of a building or a geograph-
it describes a concentration of expertise at the
of Exeter, Kent and Warwick, with the stated
of investigating the use of enzymes as catalysts
nical manufacture, especially for the pharma-
grances and polymers industries.

eration

participants are Beechams, BP, Courtaulds, Eli
matix, Glaxo, ICI, International Bio-synthetics, Pfizer, Shell and Quest International (Unilever). Collaboration between industry and the academic community is not a new idea, for the pharmaceutical and agrichemical industries have, in the course of their extensive background research and development, worked in close co-operation with universities and other institutions. The 'LINK' initiative extends this level of collaboration, allowing smaller, specialist companies as well as larger ones to have access to all the advantages available in collaborative research. Added to this is a management structure within the scheme which helps co-ordinate the research within and between the participating organisations, ensuring that resources are used efficiently.

Biotransformations are chemical processes carried out by enzymes, biological catalysts produced by living cells. Like ordinary catalysts, enzymes enable a reaction to take place yet themselves remain unchanged.

Enzymes function in a number of ways, generally acting as the workbench on which cellular chemistry is carried out. They are proteins, which have a complex chemistry and inherent flexibility that enables them either to bring chemicals together to build large macromolecules or to separate them, breaking large molecules down. Their activity can be switched on or off, according to the cell's needs. Operating within the cell, they act on low concentrations of a starting material, known as the substrate, and convert it into the finished product.

Nature's chemical engineers

Enzymes have a very subtle chemistry, catalysing the chemical processes of life in a stepwise fashion, they have to do this, because the amounts of energy locked within the reactions are so great that an uncontrolled reaction could easily destroy the cell. Enzymes tame these processes, carefully co-ordinating the construction and dismantling of various molecules. In this way they act as nature's own chemical engineers, controlling and regulating the biochemistry of the cell.

Here at the University of Kent, Professor Chris Knowles and his team are no strangers to biotechnological research involving biotransformations, for they developed a process in the micro-organisms used to detoxify organic cyanide.

The technique was based on the ability possessed by many species of plants, fungi and bacteria to produce and detoxify cyanide under natural conditions. This characteristic is widespread in the living world: important crop plants such as cassava and sorghum are well known for their ability to produce cyanide yet remain unharmed. A fungal disease of sorghum Gloecercospora sorghi was found to be capable of living on cyanide-producing tissue, because it produces cyanide hydratase, an enzyme able to convert the highly toxic cyanide to less harmful formamide by the addition of water:

$$\underset{\text{Cyanide}}{HCN} + \underset{\text{Water}}{H_2O} \dashrightarrow \underset{\text{Formamide}}{HCONH_2}$$

The team investigated a series of organisms and discovered the fungal tissue of Fusarium lateritium to be a rich source of cyanide hydratase, which was able to operate in high and low concentrations of cyanide to completely detoxify the hazardous compound.

Commercial implications of this discovery were obvious: cyanide is widely used in the chemical industry in the production of paints, plastics and electroplated metals, and is frequently an unwanted by-product in many other industrial processes including the manufacture of coke and steel.

Because the ability to detoxify cyanide by the use of cyanide hydratase was shown to be of considerable potential value, Knowles and his team collaborated with ICI who then went on to produce a commercially available system. An enzyme-rich dried fungal concentrate is currently marketed by ICI Bio-Products Business under the tradename CYCLEAR. This innovation won for ICI the 1984 Royal Society Pollution Abatement Award.

Selecting bacteria

There have been a number of other spinoffs from the research programme, designed to identify and isolate microorganisms (and their enzymes) capable of detoxifying industrial effluents. The major challenge of the work lies in selecting bacteria which continue to work in the hostile environment of concentrated effluent and are abl stand conditions that often are bactericidal.

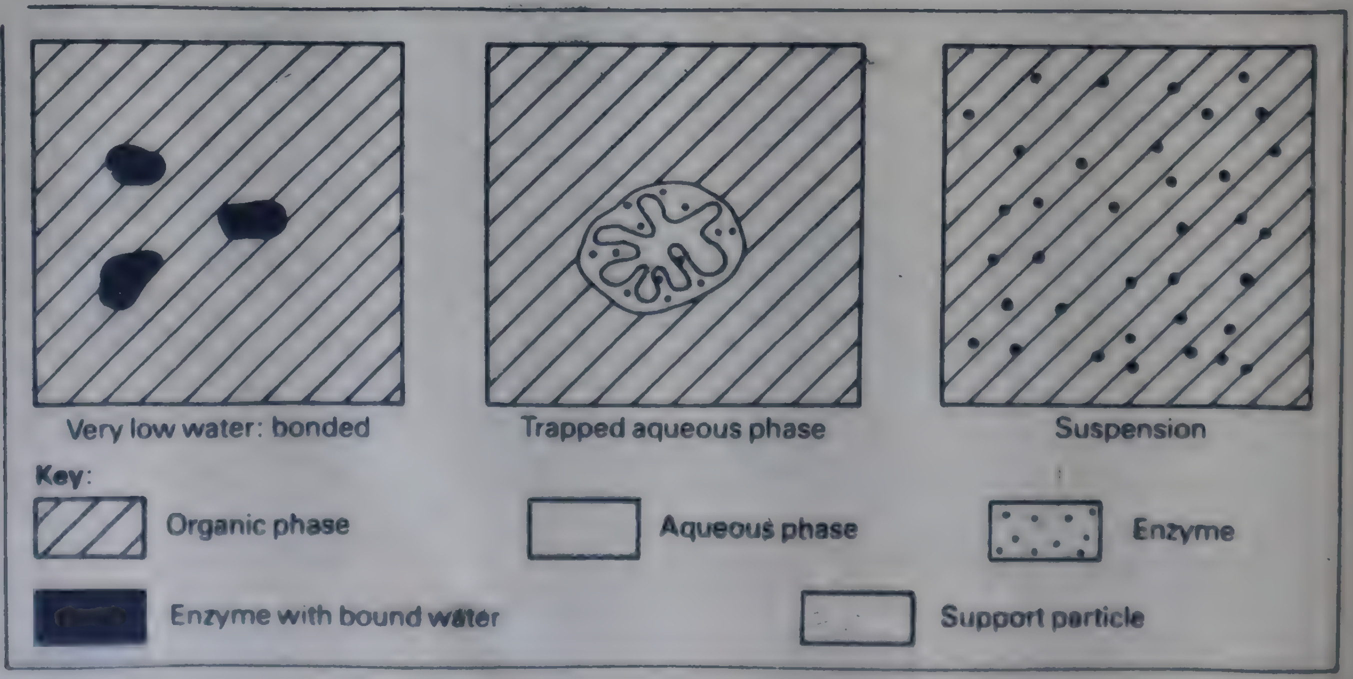
Another characteristic feature of enzymes is tha play specificity for one or a few related compound able to convert them to a wanted end product. In t enzyme action differs from traditional catalytic ch where processes are relatively non-specific and unde reactions which result in unwanted by-products of cult to eliminate. These by-products may underg reactions and combine to form inconvenient tarry within the reaction mixture. This may damage the a and may reduce the reactions themselves to someth hit and miss affair, with variable efficiencies and ex low yields. At the very worst it may ruin the proc making the end product inseparable from the reaction m

In some cases enzymes can achieve results that are no sible by other methods of synthesis. Important drugs as antibiotics and beta-blockers can be altered to impro effectiveness by slight changes in their chemical stru Some of these alterations can be carried out only by bio formations, because they require accurate, piecemea ical changes characteristic of enzymic action.

High stakes

In financial terms, the stakes are high in the prod of so-called fine chemicals, specialist compounds tha to be produced in relatively small amounts with a high d of purity. Such a requirement makes the use of enzym the required reactions economically sound.

Biotransformations can also be used to produce comp that are free of contamination. This is particularly imp in the pharmaceutical and agrichemical industries. w unwanted toxic contaminants may persist even after trea



Diagramatic examples of two-phase biotransformations systems

this is seen in 2,4,5-T, a herbicide based on
hormone, where the active ingredient is con-
mall but significant amounts of dioxin, one
ic chemicals known. These problems could
y the use of biotransformational systems to
r but uncontaminated compounds that could
b.

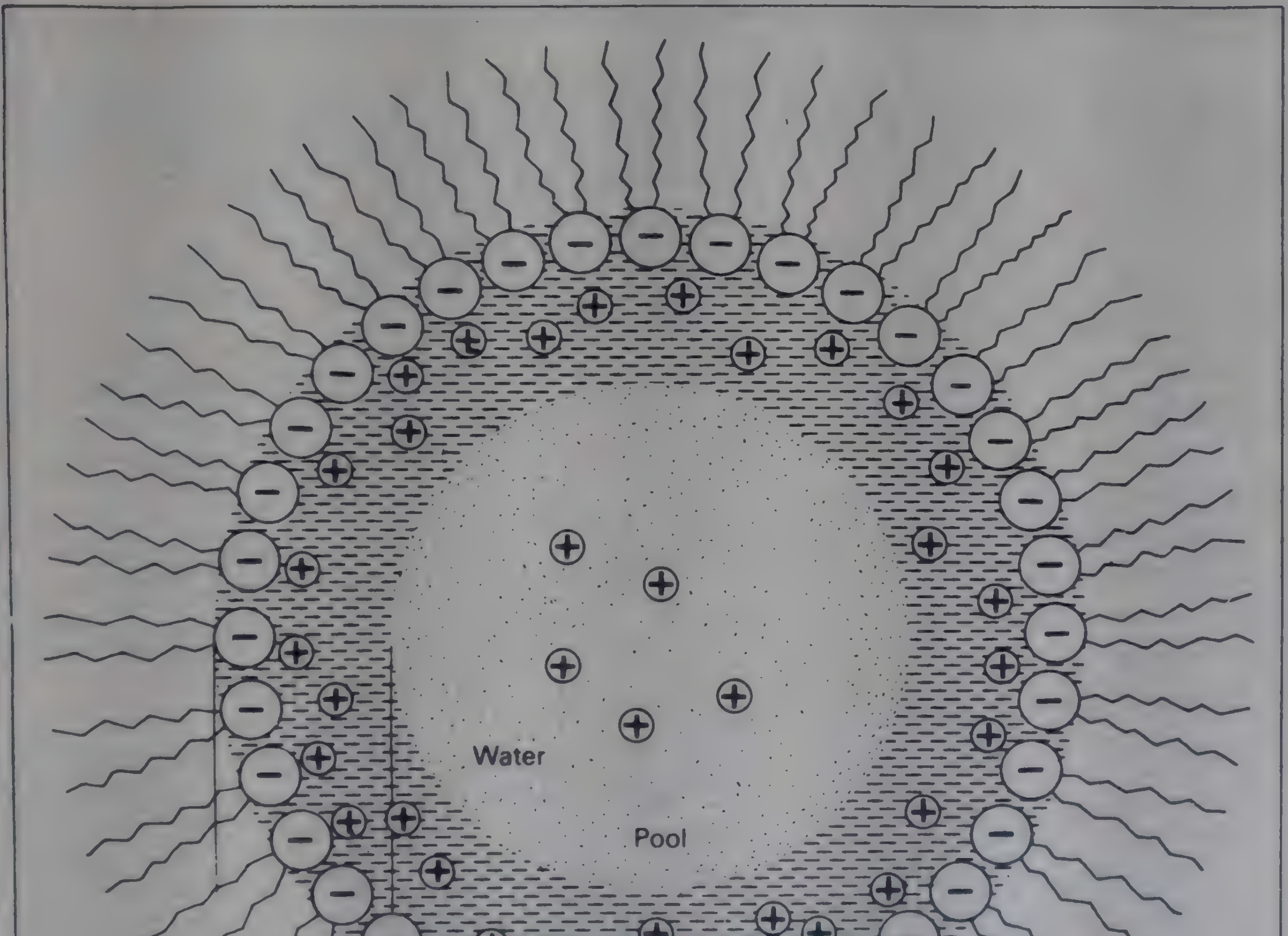
considerations are of prime importance in the
f pharmaceuticals, where contamination is a
issue involving not only foreign chemicals but
s of the same molecule. Many molecules have
ulae and similar structures, differing only in
d symmetry, one being an exact mirror image
In nature, this 'handedness' of molecules can
ir ability to function. Proteins for example can
ut of 'left handed' amino acids (L-amino acids),
lly produced sugars tend to take their 'right
form.

Introducing a compound in its wrong form can be met with either an inconvenient lack of response or more fundamental catastrophic failure. The dangers of this were highlighted in the late 1950s, in the tragic consequences of using the drug thalidomide. In one form, the drug produced beneficial effects, whereas its mirror image caused disastrous birth defects.

By using biocatalysts, products can be produced exclusively in either their left or right handed forms, which is not possible using traditional synthetic techniques. Such precision allows drugs to be produced in a known form, tailored to individual requirements with a level of efficiency that makes such processes economically sound and desirable on grounds of safety.

Organic media

For all these advantages, such as specificity, accuracy and precision, there are a number of drawbacks which have until recently made the use of biotransformational technology unat-



mulsion droplet, a water pool is surrounded by a spherical monolayer of surfactant molecules, with their hydrophobic tails pointing nto the organic solvent. The enzyme is contained within the aqueous phase in the centre of the droplet.

tractive on a large-scale commercial basis. Many industrial processes use compounds that have a poor solubility in water, such as those used in the petrochemical industry. Because of this, synthetic chemistry is often carried out in organic solvents containing high concentrations of reactants. Water is regarded as a bulky complication to any process, expensive to remove from the mixture by evaporation. The conditions prevalent in 'traditional' chemistry have long been considered to be incompatible with the requirements of biological systems which, by virtue of their evolution, operate in a predominantly chemically dilute, aqueous environment at temperatures below 45°C.

However, it is now apparent that this need not be the case, for a number of enzyme controlled processes work well within organic media. Research in this area has produced a series of exciting breakthroughs in the technique of doing enzyme-based work in organic solvents. There are a number of ways in which this can be achieved. Possibly the simplest technique is the use of slightly 'damp' enzyme; investigators have discovered that such 'nearly anhydrous' enzymes can do their job in surprisingly little water, forming a suspension within the organic solvent.

In another method, water is chemically bonded to the enzyme using a coating of a bonding compound such as polyethylene glycol, well known for its antifreeze properties. Water molecules stay tightly bound to the enzyme and enable it to function while in the organic media. Water can be bound to an enzyme in other ways: one example of this is the use of a gel-like material to trap the aqueous phase and allow the enzyme to operate within an environment conducive to its natural mode of action.

Single phase

While the above methods can be viewed as two-phase systems, there is a further technique which allows the reaction to operate as a single phase. Certain microemulsions investigated by Professor Robert Freedman, a colleague of Professor Knowles, are composed of extremely fine droplets of water which, once dispersed in oil by the use of a detergent-like surfactant, give a clear solution. The water droplets are of molecular proportions, millionths of a millimetre in size, and are just large enough to accommodate a single enzyme, stretching slightly as they do so.

In the development of systems that allow biotransformations to be carried out within organic solvents, a number of advantages have been observed. One benefit is a shift in equilibrium which occurs when certain water-based processes operate in organic media. In some instances, enzymes that are otherwise destructive have been work backwards: proteases originally designed to br proteins actively build them up out of amino acids. nomenon has considerable potential because it en reactions to be catalysed by cheap, readily available which, while running backwards, can be used to more complex, costly molecules out of relatively sim in a fast, energy-efficient way.

The enzymes themselves can be protected from a up of reactants which might otherwise inactivate shunting the products of the bioconversion into the phase where they remain isolated from the enzyme way the organic phase of the reaction system can beh as a sink, removing the product from the aqueous ph as a reservoir of the starting material, supplying enzyme.

Use of a two-phase system lends itself well to being up for use in the commercial production of biotrans molecules such as pharmaceuticals, agrichemicals, f ings, fragrances and dyestuffs. Reaction systems immobilised in materials such as hollow, semi-perm fibres that allow the finished product to be recovere ciently from the reaction mixture.

A number of chemical companies have carried out sive research in these areas. Unilever UK and the F Company of Japan have both developed biotransform systems in which cocoa butter can be synthesised from tively simple oils, including palm oil. In this way an ex sive commodity much sought-after in the confectionary can be produced from cheaper ingredients by biotra mational techniques.

It is the great commercial value of these developme biotechnology that has led to an increase in research ac Work at the Inter-University Biotransformations Cen being carried out in close co-operation with the comp that have helped fund the research. At Kent, the research is continuing its search for new, useful enzymes that ca used either in the form of entire organisms such as ba or as isolated enzymes. Organisms which are seen to duce enzymes capable of processing unusual materials verting them into harmless or valuable compounds, are h isolated, identified and examined for their ability to op under a broad range of conditions.

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yl alcohol production in India -- some observations

S.L. VENKITESWARAN

ol, referred to by general practice in India hol, is the gift of the sugar industry in India aste or by product after sugar crystallisation stages molasses.

lly 4% on sugarcane or 40% on sugar on average a production of 220 to 250 litres of alcohol ending on its total sugar content. This is about eoretical yield and can be raised to 91% or more oved systems of fermentation. Over the past 15 as been a spectacular rise in our sugar produc- l of 9 million tonnes and the target for the 8th to be set at 12 to 13 million tonnes-in turn result- 2 million tonnes of molasses. The use of molas- for alcohol is so small that nearly 80% has to be o alcohol over 1000 million litres. Quite a large eeds to be used as a base for suitable organic d the quantities are expected to go up by 8% year in line with the growth in sugar demand.

deed a very fortunate situation for India. Syn- l has taken over a large part of the demand in countries and fermentation alcohol is mainly for The industrial requirements of alcohol are much he potential of production from molasses, of sug- garbeet. The chemical conversion of alcohol is d in recent years the use as fuel for blends with ne has come into the picture. The production of l in USA for such fuel use is based on corn has reached levels far higher than India's output. e alcohol is also derived from sugarbeets directly atoes and prices in both USA and West Europe gher at 30 to 40 cents per litre. Waste molasses st source for alcohol and when linked to the sugar from cane there is often the additional bonus of am at low pressure which could lead to low cost

one country which has gone all out for alcohol automobiles and has reached a level of near 10 a year in over a decade. The alcohol production tive to sugarcane use for sugar and treated as a f sugar with pricing of the two suitably adjusted. paid for at the level of petrol prices but without and when used for chemicals it is sold at 35% of petroethylene. Cars are designed and made eat alcohol. Although the policy was framed to ign exchange outgo on oil imports the discovery us oil in recent years has caused some problems cy is continuing. In the US the use of alcohol in is more due to the clout of the farmers who find it difficult to sell their maize, besides environmental consideration and the TEL phase-out.

India's primary position as the top producer of alcohol from molasses also has its own problems. The very low price for molasses and coal in the early years of development the sixties, seventies and early eighties and the easy way in which alcohol is produced from molasses led to a virtual dependence on traditional technologies and no incentives for improvements. The main criterion was the cost of innovations vis-a-vis the savings in cost of molasses or steam consumed. This was heavily weighted in favour of traditional methods until the large escalations in price of molasses and coal from the early eighties. Also the justifiable outcry against the effluents after alcohol distillation has led to the search for process improvements. We have been singularly negligent on R & D and now again look to overseas sources for improvements but find that there is very little on offer. Molasses and steam today account for Rs. 1.7 to 2 per litre of 95% pure alcohol and the need to cut down on these two items is all important. Effluent treatment can account for an additional cost of 30 to 40 paise per litre but there is a return through energy generated in the form of biogas or combusion heat.

The Indian efforts on better technology is very limited and one of these is on the reuse of yeast to step up the efficiency of fermentation by 5 to 7%. the Indian process uses a flocculating type of yeast which avoids the need for centrifugal separation while an alternative approach from foreign sources uses higher concentration of the residuals after fermentation for yeast separation in a centrifuge. The merits and claims of these alternatives require in-depth analysis.

Another Indian effort has been on the use of cellulosic waste materials after hydrolysis by enzymes into glucose. The early developments were in the context of years of molasses shortage, which have now ended. The process on offer for scale-up is said to be for converting straw or corn cobs into alcohol. The economics and capital costs have yet to be evaluated. In this context we have to look at the question from a wider context. Bagasse is the preferred source of cellulose material for pulp and paper and it is also an annual crop residue. Our needs for paper and newsprint are much higher than what is possible to produce from our grass, bamboo and forest resources. The best way is to tap bagasse from sugar factories by providing alternate energy to them. Cellulose as a source of alcohol is not for this century but the pentosans associated with the cellulosic material can serve as a source of alcohol. The pentosans can be separately hydrolysed under mild conditions by acid without affecting the cellulose.

Another elegant process is the hydrolysis of bagasse by alcoholic alkali when non-cellulosic material gets dissolved leaving cellulose fibre for easy filtration. The solution can be processed for recovery of a pure grade of lignin and pentose fraction. NRRL of Peoria, USA, have carried extensive work on converting xylose to alcohol using a special strain of yeast-Sacch Tannophilus with good yields. India may not need to tap such alternative sources for two decades perhaps unless there is a major policy shift to generate liquid fuels from non-hydro-carbon sources.

Incidentally it may be mentioned that the spent wash containing the residual non-fermentables can be used to produce yeast of feed grade (Tourla utilis) or even the regular S. Cerevisia for fermentation. Such work was reported from France a long time back but circumstances then did not warrant such use.

Getting back to the subject of energy savings and better efficiencies there are a few lines of work in the USA which could be of interest for us. The vacuum fermentation is most promising. In this a part of the fermenting liquor is withdrawn into a flash chamber where vacuum sucks out the alcohol and the liquor is recycled back to the fermenter with the yeast cells intact and along with fresh medium. The vacuum derived vapours are compressed and rectified to get pure alcohol either by itself, or alongwith a separate stream from the fermenter taken for direct distillation. The vacuum flash enables the alcohol content of the main fermenter to be kept below levels which tend to inhibit the fermentation. The system is certainly worth a trial for wider adoption if investments are not unduly high and electric power is readily available.

The most important advance for saving in steam required for the distillation is through MVC-Mechanical Vapour Compression-heat recovery. The rect spirit vapours going for condensation can be compressed and used as the source of heat at the base of the column and condensates returned to the top of the column as reflux. This is the best way to cut down overall steam requirement to about 1 kg. per litre but the compressor system is expensive and electric power requirement is large. The conditions of electric power supply may be favourable in certain factories for a detailed study of MVC System for alcohol distillation. The use of steam ejector for vapour compression and reuse is already p in some factories in India.

Another interesting method has been patented i and is based on ultrasonic vibration in the fermen auxiliary tank whereby voids are created. The void a be connected to a suction pump when it is claimed th strength alcohol can be tapped off leading to a redu steam for final product recovery. Details are only o atory scale but the idea is worth trials to assess pote commercial use.

Another interesting development is of the use of dr powder as an absorbent for water in the dehydration vol. alcohol to the 99.5% + Grade required for fuel The absorption and dehydration of corn powder is need less energy than the azeotropic dehydration me But by far the lowest energy needs for dehydratio "double effect" system where rectifier is run under abo atm pressure when the boiling point is raised sufficien heat transfer to the alcohol boiling at the base of th dration column.

Another aspect which needs to be studied for a co interested in alcohol-based chemicals is the possibility o gration of alcohol distillation with the chemical conve For example the feed to the acetaldehyde reactor nee necessarily be of 95 per cent and there is technically no for a condensation and reevaporation of the feed to the tor. Links between the rectifier and the aldehyde reac possible. It was also reported that ethylene from ethan be operated even at lower concentration levels and i grated operations. One could visualise 60 to 70 per cen hol vapours being directly fed to the ethylene reactor a preheating.

I have tried to elaborate on India's alcohol productio need for improvements and innovations on our own no in efficiently converting molasses to alcohol but als in terms of integrating the alcohol distillation with che conversion so as to strengthen our position and be a setter in this area. There are various problems arising the excise policies that have been pursued on this ver cately controlled industry but these could be relaxed interests of efficiency and energy savings.

Refinery investment planning*

J.C. HOLDSWORTH
Foster Wheeler Energy Limited

ther industrial operations of any complexity,
ations require forward planning to ensure that
ucts are made at the right time, at the right place
ght cost. Petroleum refining and petrochemical
a highly integrated processing system. It is also
ive in equipment, individually designed for spe-
ns and not easily adapted for other uses. In an
l company, or in some instances national eco-
ing operations must also be planned in conjunc-
de oil production and transportation and with
on and marketing of products. All these aspects
need to use a three tier rolling planning pro-
n depends on the planning time horizon involved;
term, medium term and short term planning.

ctive of this paper is to describe the techniques
logy exployed by Foster Wheeler when involved
y's or national government's long term planning
is activity is typically concerned with the pre-
tion one to five years, or even more, ahead. It is
tify decisions which are needed regarding such
investment in major new processing plants.

es consideration of long range of such factors as
for new and existing products and their prices,
ility of different crudes and their costs, the pos-
ties of competitors, fuel substitution and national
rends. Since there can be considerable uncertainty
with such aspects, these uncertainties also have
into account.

inery investment planning process therefore

view of the future in relation to the anticipated
of feedstocks and products and their relative prices.
at and developing the best way of satisfying the
ed market from a technical and economic stand-
identify possible courses of action.
ing the alternative courses of action, selecting the
d scheme and ensuring that it is adequately robust
ges in various input parameters.
enting the preferred scheme.

es used for refinery investment planning

the most useful tools at the disposal of the refinery
t planner is linear programming. Linear programming (LP) is a mathematical approach to the solution of an optimisation problem in which the particular problem can be expressed in a series of linear equations or inequalities. The optimisation is made within user imposed constraints on a particular objective function. The objective function is typically profit or capital investment which is maximised or minimised respectively to produce the desired optimal solution.

For performing their refinery investment planning studies, Foster Wheeler has developed a custom build program utilising linear programming techniques to optimise refinery or petrochemical complexes against input criteria and constraints. The program was developed to eliminate most of the laborious hand calculations formerly required to accomplish an in-depth refinery economic study. Utilising the program enables the most economic refining or processing scheme to be sought amongst the infinite number of alternatives within the constraints that have been set. The program is capable of handling extremely complex processing schemes limited only by the users' ability to devise and accurately describe all the significant alternatives and their ability to interpret the results. A feature of the program is that it transposes and manipulates the raw optimised data into a management report that is understandable and completely describes the optimal scheme.

Other computer models are employed in the planning process. Using usually a spreadsheet system, economic and financial models are created which are tailored to the environment in which the project is being considered.

The planning process

To be viable, a refinery must convert all the crude oil into products of the highest total value. Since crude oils from different sources vary in composition and quality, the market demand pattern for products rarely matches the pattern in which they occur in their natural state. Therefore, an important function of refining is to rearrange the natural pattern of products into what is actually required.

Another important characteristic of a refinery is its processing flexibility. This is the extent to which it can accommodate changes in the demand patterns or quality specifications of its variety of products or changes in the type of crude oil processed. It is not possible for a refinery to be completely flexible. Therefore, an important part of the planning process is to consider what flexibility can be accommodated without escalating the project cost so as to affect

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ented at the Oil, Gas and Petrochemicals Seminar held in New
uary 1989.

the viability of the project. It is thus necessary to be satisfied that the size and configuration of the project is optimised, and most importantly, that it is adequately robust to changes in the input parameters.

In embarking on a study of a new project it is is necessary to first establish the overall external criteria. In summary these are:

- product demand
- product specifications
- feedstock availability
- crude cost and product prices
- existing facilities
- investment limits

Looking at these in more detail

Product demand

The first information that is required is the predicted product demands for all the petroleum products. These can be either a maximum capacity demand representing the highest expectation of the product market, a minimum demand representing long term contracts or even a fixed demand where there is no long term flexibility in the market for a particular product. Predicting future markets for a refinery which may not be onstream for five years and which may need to repay its loans over a further 10 years is shrouded with uncertainty. When Foster Wheeler is requested as part of the study to take a view of future markets, a scenario approach is adopted.

Scenarios attempt to define a series of consequences arising from basic assumptions about what the future could be like. Taking this approach provides the opportunity to see if the proposed scheme could be viable under different sets of internally consistent circumstances. If it looks profitable under only one scenario but seems vulnerable on others then there is an apparent lack of robustness in the scheme. If, however, a project continues to display a profit under different assumptions, it points to a level of robustness which gives increased confidence in the scheme.

Product specifications

The range of specifications that the products have to meet are required. An important point to establish is whether there is any legislation being considered that might relax or tighten any of the specifications. The study may in fact be to consider the implications of such a change.

Feedstock availability

The feedstocks that are likely to be processed by the refinery are identified. Restrictions on their availability are also established. If the new investment is being considered around existing facilities it is important to establish what crudes the existing facilities are capable of processing.

Crude cost and product prices

Having established the crudes a
ducts to be produced and their spe
to establish both the likely cost of
ducts. Again, predicting such future
uncertainty. To obtain such view
Wheeler either employs outside co
in-house economists. When devel
approach is adopted for the cost an
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Existing facilities

If the new investment is to be ba
lities — either process units or utility
tified.

Investment limits

Finally, any externally imposed l
or minimum, size of the project eith
are established. Other factors are also
on the project viability, such as expe
rates of return etc.

Having obtained the set of extern
study is subject, it is then possible t
internal criteria and the definition
ming model.

In the formulation of a refinery mo
ibility which is possible in the potent
so that when it is optimised the most
tion can be sought. This requires sele
operations to be considered for sele
together. If the potential future investm
existing facilities and these facilities
it is appropriate to build them into th
the potential options.

In order to ensure that all possible
considered, the initial set of unit opera
tion are made larger rather than smalle
it is relatively much easier to suppres
ration from coming into a solution th
specifically if the study develops or th
[illegible] and the understanding of the [illegible]
Diagram is produced. This serves [illegible]

nd how the various streams

of unit operations, for exam-
ytic cracking, etc., the poten-
established and a decision is
points etc. to be incorporated
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rs are then developed for each

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del of the refinery and tested
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gainst a set of external criteria
ion to the problem. In arriving
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P as giving the optimal values
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[illegible] of the economics of the

refinery via removal or alteration of key constraints. For example, it will indicate the relative value of relaxing a particular product specification or identify products which could profitably be sold in larger quantities. This information is particularly useful for deciding which other runs might be appropriate.

Having arrived at the preferred scheme and possible alternatives using the LP refinery model, the next step is to test their absolute viability as an investment proposition. Detailed economic analysis is performed on the proposed scheme(s). At this stage, the investment costs and operating costs of the proposed scheme can be re-examined in more detail for the precise scheme.

The detailed economic analysis is used to confirm the actual economic viability of the preferred scheme and to test its sensitivity and robustness to changes in various economic criteria. Criteria considered are as follows:

- different crude and product price scenarios
- changes in specific prices
- changes to the investment cost
- project delays
- changes in operating costs
- loan repayment period, if applicable

It also reviews the viability and robustness of the alternative schemes thus ensuring the best practical scheme has in fact been selected.

If the results of such changes conclude that the preferred scheme is robust from an economic standpoint, the scheme is then further studied with the LP refinery model to test its technical robustness and sensitivity to changes in feedstock, demand levels, product specifications etc. Parametric analysis, available within the linear programming system, is often used at this point.

This analysis may well result in further changes to the proposed scheme by introducing additional flexibility. If this transpires, the scheme is again subject to a further detailed economic analysis to ensure that it is still economically viable and robust and the changes to the scheme are cost effective.

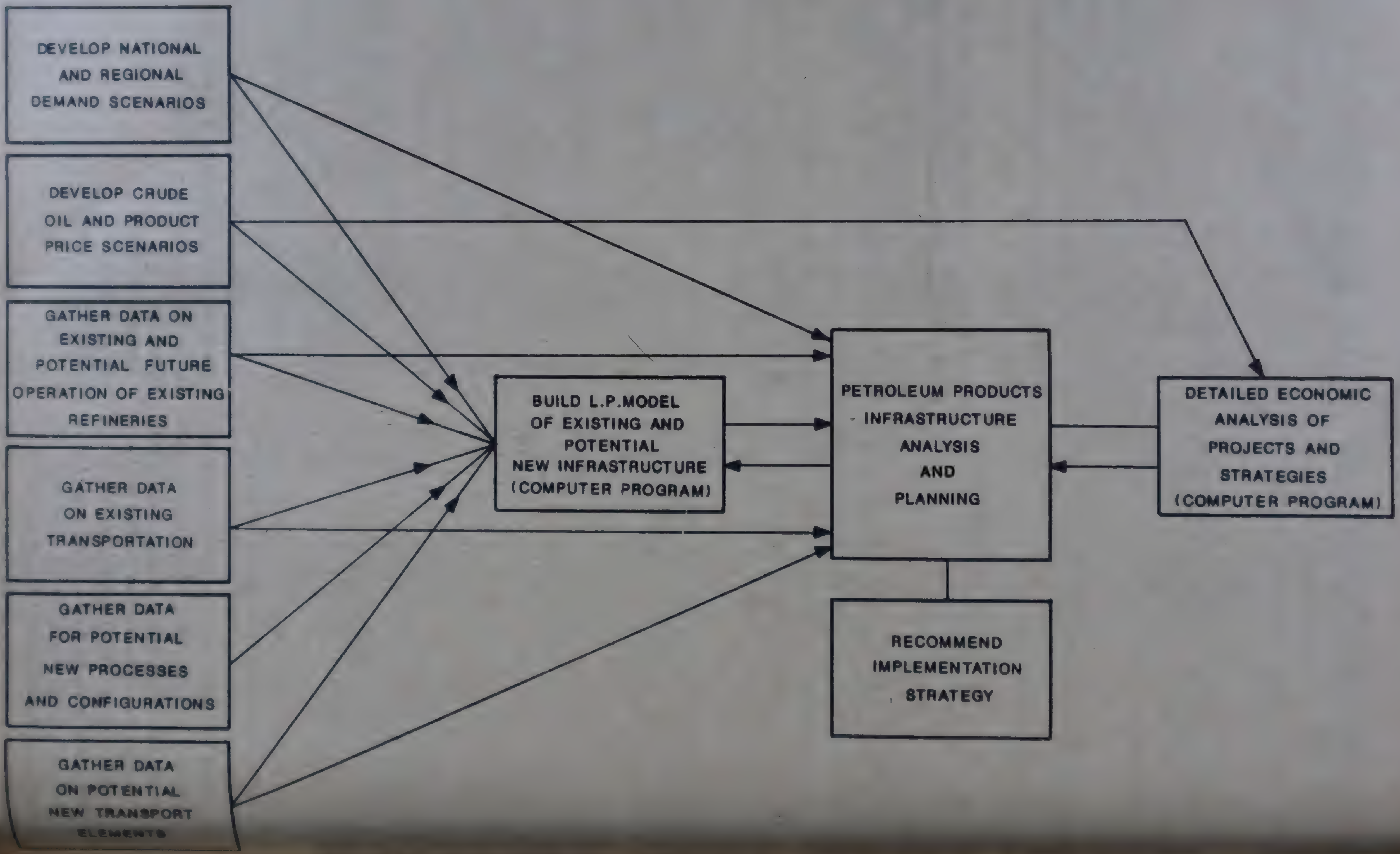
At this stage in the planning process, one should have a scheme which is both technically realistic and economically viable. The next step is to test its financial viability. Here aspects such as:

- depreciation policy
- taxation policy
- inflation/escalation

are considered.

If the proposed scheme is still viable at this stage and a

FIG.1. INTERRELATIONSHIP OF INFRASTRUCTURE ANALYSIS



DEVELOP NATIONAL AND REGIONAL DEMAND SCENARIOS
DEVELOP CRUDE OIL AND PRODUCT PRICE SCENARIOS
GATHER DATA ON EXISTING AND POTENTIAL FUTURE OPERATION OF EXISTING REFINERIES
GATHER DATA ON EXISTING TRANSPORTATION
GATHER DATA FOR POTENTIAL NEW PROCESSES AND CONFIGURATIONS
GATHER DATA ON POTENTIAL NEW TRANSPORT ELEMENTS
BUILD L.P.MODEL OF EXISTING AND POTENTIAL NEW INFRASTRUCTURE (COMPUTER PROGRAM)
PETROLEUM PRODUCTS INFRASTRUCTURE ANALYSIS AND PLANNING
RECOMMEND IMPLEMENTATION STRATEGY
DETAILED ECONOMIC ANALYSIS OF PROJECTS AND STRATEGIES (COMPUTER PROGRAM)

the necessary funds can be raised to sup-
ct can then proceed into the next phase of
This could be the development of the pro-
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er factors may be involved before the invest-
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ues and methodology identified are suitable for
finery investment planning studies covering the
nall revamps or inclusion of new unit opera-
ng facilities through to assessing the viability
nsions or complete grass root refineries and pet-
mplexes. They can also be applied to perform-
m product infrastructure studies for large
d national governments. This entails planning
y operation in conjunction with crude produc-
sportation and with the distribution and mar-
ducts.

In a recent application the viability of increasing a country's refining capacity to meet the country's internal projected demand was assessed, together with assessing the country's transportation system for moving feedstock and products against the future requirements.

The elements of the study included:

- Development of national and regional demand
- Development of crude oil and product price scenarios
- Gathering data on existing and potential future operation of the existing refineries
- Gathering data on the existing transportation system, i.e. roads, rail and ports
- Obtaining data on potential new transportation elements
- Obtaining data for potential new processes and configurations
- Building a linear programming model to represent the existing and potential new infrastructure
- Performing infrastructure analysis and planning
- Performing detailed economic analysis of projects and strategies

From these elements an implementation strategy was proposed. Fig 1 shows the inter-relationship of the elements of the study which led to the recommended strategy.

Conclusion

New refinery investment involves large sums of money. The planning process therefore deserves very close and detailed attention. It is thus important to be satisfied that such an investment:

1. is optimised though it may not necessarily be the theoretical optimum
2. can accommodate changes in demand patterns; quality specifications of its variety of products; or changes in the type of crude oil processed
3. is technically realistic and economically viable and is robust to changes in various input parameters

Using the techniques and adopting the methodology outlined in this paper ensures that the above objectives are satisfied.

News from Abroad

BP TO GO AHEAD ON ETHYLENE PLANT

BP Chemical (London) has decided to go ahead on its decision for a huge addition to its Grangemouth, U.K. ethylene plant as a part of an integrated 85 million dollar oil and gas processing plant.

About 386 million dollar will be spent on raising ethylene capacity at the Grangemouth facility, boosting total output from 270,000 tonnes/year to 600,000 tonnes/year by mid 1992. Liquefied petroleum gas feedstock will be supplied from the North Sea via an enlarged processing plant over the fence at Grangemouth.

The ethylene is intended for internal consumption. The company is scheduled to bring on stream a 125,000 tonnes/year linear low density polyethylene unit at Grangemouth, early next year. A 96,000 tonnes/year polyethylene plant at the site is being shut down.

The company is also adding 100,000 tonnes/year to the high density polyethylene plant at Grangemouth, which will take capacity to 250,000 tonnes/year by 1990. Polyethylene capacity at Grangemouth will reach 375,000 tonnes/year by the end of 1990 BP Chemicals has also debottlenecked its low density polyethylene plant on ICI's Wilton, UK to 100,000 tonnes/year.

Although the BP unit is identical to that of the No.6 Phillips Petroleum unit at Pasadena (Texas) that blew up October 1988, the company has done extra safety check, to ensure safety, according to a company spokesman.

US TO TAX CFC MANUFACTURERS

The US congress has recently cleared a deficit reduction bill that imposes a [illegible] tax on chlorofluorocarbons and other chemicals. The tax approved over the objections of the chemical industry levies a charge of $1.37/lb in 1990 and 1991 on CFC-11, -12, -113, -114 and -115 and on Halon-1201, 1301 and 2402.

In 1992 the tax jumps to $ 1.67/lb and in 1993 and 1994 to $ 2.65/lb. By the end of the next decade the tax will reach $ 4.90/lb. The tax is expected to raise $489 million in 1990 $ 691 million in 1991, $ 784 million in 1992, $ 1.05 billion in 1993 and $ 1.3 billion in 1994.

The measure exempts feedstock chemicals and recycled CFCs. Substances used in making foam insulation are also example from the 1990 tax and will be taxed at a lower rate in recognition of their energy-efficiency value. The CFC tax, when levied, is likely to hit the distribution chain, chemical manufacturers fear.

The Congress also approved a 5 ct/barrel tax on oil to create a $ 1 billion fund to help clean up oil spill; spurred by the rupture of the Exxon Valder tanker in Alaska in November. The plan also levies a 3-ct/barrel on oil produced on the outer continental shells. That fee will be collected until the fund reaches $ 200 million.

The deficit reduction bill contains important tax provisions. The congress continues to provide the basic incentive for R&D the tax system has traditionally provided and recognises that capital intensive industries are subject to inequitable taxation from the alternative minimum tax.

The bill provides for allocation of 64% of US incurred research expenses in US rather than foreign income for a nine-month period. Congressional conferees rejected a proposal that would have denied industry the ability to write off expenses for foreign R & D over several years.

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News from Abroad

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over 65,000 ton/year of sulphuric and phosphoric acids and potassium fertilizers, had a turnover of around £20m ($31.4m), with about three quarters of production being exported mainly to the European market.

The complex was previously leased to Cypriot company CCF Industries for £1.5m, but financial problems have forced the company to withdraw.

FRENCH MOVE FOR NH

Norsk Hydro's French affiliate, Norsk Hydro Azote, has taken a 40 per cent stake in Sud Fertilisants, a subsidiary of French fertilizer company Cedest. Under the agreement Norsk Hydro has given Cedest its L'Etang de Thau fertilizer unit located near Sete, South East France.

Both partners in the joint venture have increased their corporate capital by some FF62.5m ($10m) thus providing Sud Fertilisants with FF110m of equity. The joint venture will produce 500,000 ton/year of fertilizers, making it the leading producer in the South East and South West regions of France.

PETRORIO LAUNCH CLEARS THE WAY FOR ITAGUAI

Petrorio, the company created to set up the proposed Itaguai Petrochemicals complex in Rio de Janeiro state, was officially inaugurated recently. It will serve as a basic services company for the complex, responsible for installing and operating the central raw materials unit, as well as providing thermoelectric power, supplying water and treating and disposing of liquid and solid effluent.

Companies participating in the Itaguai complex are obliged to subscribe to Petrorio's share capital, which consists of an initial $16m, plus a proposed capital increase of $145m, which is likely to take place over the next few months. Petroquisa, the petrochemicals arm of the state oil corporation Petrobras, will take a 35 per cent stake, with 30 associated companies taking 40 per cent and 12 second-generation product markers the remaining 25 per cent.

Petroquisa's vice-president and president of PetroRio's executive, Jose Juca Bezerra Neto, expects work on the infrastructure to begin in July 1990. The deadline for project proposals for Itaguai expired on 6 October. Juca expects decisions on the choice of projects to be finalized by mid-1991, and PetroRio's central raw materials unit and its dependent secondary plants to be operational by 1996.

Projects which are independent of the central unit, such as phenol, acetone and acrylic acid production units, are expected to be on-stream by 1993.

Of the projects already submitted, Empresa Petroquimica Carioca (EPC) released details of a $65m investment plan to produce 168,000 ton/year of liquid caustic soda, 90,000 ton/year of hydrochloric acid, 36,000 ton/year of sodium hypochlorite, 47,000 cubic metres/year of hydrogen, 146,000 ton/year of dichloroethane, 181,000 ton/year of monovinylchloride and 180,000 ton/year of polyvinylchloride. The project will also include capacity for 200,000 ton/year of high and low density polyethylene and polyethylene copolymers, which will be variable according to domestic demand and export opportunities.

EPC intends to finance 50 per cent of costs internally, with the remaining 50 per cent coming largely from the National Development Bank, BNDES.

EPC consists of a joint venture between Norclor, which holds 25 per cent, Ory with 22.5 per cent, Icatu Empreendimentos, also with 22.5 per cent, and Occidental Quimica do Brasil, which holds 25 per cent.

NL SETTLES OB BID FOR GEORGIA

NL Industries, controlled by Texas investor Harold Simmons, has made a \$50/share bid for Georgia Gulf, the US manufacturer of commodity chemicals and polymers. The offer values Georgia at around \$1.2bn.

NL, which already holds a 9.9 per cent stake in Georgia, originally approached the company with a proposal for a merger, takeover or recapitalization in late August 1988. It suggested a transaction where shareholders would receive \$55/share.

NL says it reduced its offer to \$50/share because the current unsettled state of the junk bond market would make financing more difficult to procure and because of poorer results forecast for Georgia.

Georgia Gulf has reviewed the proposal from NL, as well as "indications of interest from other third parties relating to various forms of business combination."

However, it says no alternatives have been eliminated from consideration and gives no assurance that any transaction will take place. It is holding discussions with interested parties.

Meanwhile, Georgia has agreed to form a joint venture with Atochem to market its special purpose moulding vinyl compounds in Europle, Africa and the Middle East.

The venture, 55 per cent owned by Atochem and 45 per cent by Georgia, wil provide for Atochem's sales network to market the products and for their manufacture in Atochem's existing facilities from early 1990.

SOLVAY DIVESTS US GE FIRM

Belgium's Solvay has sold
US pharmaceuticals operat
pharma Inc, to Molecuon
\$22m. Molecuon is the US
of the Australian drugs comp
Faulding. The move is in line
vay's strategy of focusing o
ceuticals specialities. Kalipharm
in New Jersey, produces gene
maceuticals. Faulding now own
cent of Moleculon's voting s
has an agreement to purchase a
tional 19 per cent.

This, together with its ho
preferred convertible stock, give
ing the option of increasing its
70 per cent. Duphar Medical
a division of Kali-Duphar Inc a
Solvay subsidiary, is not par
deal.

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hemical markets abroad

IEMICAL PLANS
PEAN PRODUC-

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A draft negotiating
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be susceptible to a 20-30
e in their share of EC
most dramatic scenario for
the West European market is one where prices may come under such pressure that while other deep sea suppliers are forced to withdraw, being no longer able to cover variable costs, the GCC producers would meanwhile continue exporting due to their lower feedstock costs.

The commission believes a transitional phase will allow European industry to undertake the restructuring necessary to face the challenge. It also sees a market in the Gulf for European hi-tech products. While Cefic recognizes the need for technical innovation if the industry is to stay competitive, it maintains this process is already under way.

In Cefic's view, the stimulus coming from integration with the Gulf will be unnecessary, and would in fact jeopardize downstream industries dependent upon European petrochemical production.

The feeling among producers is that they are being sacrificed to an unfair bilaterial agreement being dictated by mainly political considerations.

THERMOPLASTICS DEMAND RISES

European consumption of thermoplastics looks set to reach 13.6m ton/year in 1988-1989. The largest user will be West Germany with demand of some 4.7m ton/year, according to consultant Phillip Townsend Associates. France follows with consumption of 3.4m ton/year and then the UK with 3m ton/year.

Polypropylene is the most used feedstock by European plastic processors, being preferred by 2,428 convertors, this is followed by phthalic anhydride, the feedstock in 2,318 sites.

In a detailed look at France the consultant claims PVC is the most commonly used polymer, with 805,000 ton/year being processed in the time period.

Customers used a total of 669,000 ton/ year of ldPE in 1988-89, followed by polypropylene at 425,000 ton/year.

The most popular process in France is injection moulding with 1,103 convertors preferring this technology.

Lagging way behind is film extrusion utilized in some 152 French polymer units.

The three largest convertors in France are DSM at Lyon, Atochem at Saint Chamont and Autobar Federation based in Firminy.

EEC petrochemical imports

	From GCC (ton)		Total (ton)	
	1988	Q1 1989	1988	Q1 1989
Styrene	30,000	10,000	150,000	40,000
Methanol	600,000	200,000	1.8m	500,000
Ethylene glycol	70,000	13,000	180,000	30,000
Diethylene glycol	20,000	4,000	40,000	6,000
Melamine	23,000	2,000	33,000	8,000
lldPE	140,000	14,000	280,000	52,000
hdPE	80,000	8,000	280,000	60,000

SODA ASH PRODUCERS INCREASE OUTPUT

European and US soda ash producers were able to operate close to capacity rates last year as demand rose and caustic soda markets tightened. According to UK consultant Roskill Information Services world soda ash production rose by 8 per cent in two years from 1986.

However, although the industry appears buoyant it may be that the recent growth disguises what is actually a downward turn.

According to Roskill, consumption of soda ash in world market economies was virtually the same in 1987 as it was in 1974, whereas Western European consumption fell by 1.4m ton to 5.26m ton.

Over the same period consumption in the US dropped by 700,000 ton to hover at around 7m ton. The overall level of world consumption was maintained by increased rates of consumption in other areas, notably in Asia where demand rose by 50 per cent to 3.3m ton.

65 per cent of Western Europe's soda ash production is intended for the glass industry. Roskill claims the decline in demand for soda ash by Western European consumers can be attributed to the increased recycling of glass and the substitutions of metal cans and plastics for container glass products.

Roskill bases its argument on UN, US and EEC statistics which indicate that while the quantity of materials to be packaged has grown significantly since the mid-1970's, production of container glass using raw materials has remained more or less stable.

Roskill says that in 1986 Western Europe's total production of container glass amounted to around 12m ton. Of this 11.5m ton were used within Europe and 29 per cent of that involved products which had included recycled glass in their manufacture.

Switzerland, the Netherlands, Belgium and West Germany are among the European countries which use the largest amounts of recycled glass within their glass manufacturing industries.

Before container glass can be recycled it has to be sorted by colour. West Germany's glass industry has indicated that its consumption of cullet could increase from 1m in 1986 to 1.75m. ton within a few years, provided that the quality of cullet was improved through more specific colour sorting.

According to Roskill if this level of recycling were to extend throughout Western Europe, the quantity of container glass produced from raw materials would fall by around 3.5m ton, resulting in a cumulative reduction in the consumption of soda ash of 700,000 ton over a period of five to ten years.

However, Roskill anticipates a brighter future for the chemical end-uses of soda ash.

NEW US PLANT SHUTDOWNS HERALD BENZENE PRICE HIKE

Benzene prices are showing no signs of losing their volatility, jumping $75/ton in less than two weeks. Again, the US is the main driving force behind the latest price convulsion. The continued sequence of unscheduled outages is now coupled with producers suffering difficulties in restarting HDA units after maintenance turn arounds.

Cain Chemical's 330,000 ton/year plant was due for re-commissioning in the past few weeks. However, though the 200,000 ton/year reformer unit started without a hitch, the 130,000 ton/year HDA plant is causing problems. The first attempt to restart the HDA unit did not prove successful.

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a turnaround at the
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V SHIPS

ordered four new

sophisticated 38,000 dwt parcel chemical carriers, at a cost of some Nkr1.8bn ($260m). The vessels will be built at the KMV shipyard in Kristiansand, in Norway. It is expected the first vessel will be delivered by December 1991.

The new tankers are expected to utilize the latest technology, with stainless steel centres and 41 segregated cargo tanks. Jo Tankers says this latest move is part of its fleet renewal process. The current freight rates do not appear to justify new building.

This latest move continues Jo Tankers' recent trend of ordering new tankers. Last year the company ordered two 12,300dwt tankers, to be built at the Viareggio shipyard by Alta Italia. These vessels are expected to be delivered by early 1991.

STYRENE PRICE SHIFTS REMAIN UNCLEAR

After being relatively stable in October styrene has begun to attract interest in the past weeks. The position of European product remains unclear due to a number of variables. Traders claim that lower numbers of $580/ton fob NWE have been recorded in deals within Europe. However, producers claim these numbers are only available for export product.

According to sellers the range of $605-610/ton is still relevant. One definite deal of $580/ton fob NWE has been confirmed, but this is thought to be a one off deal put together by a French producer. The parcel is being targeted at the Far East, which has lower inventories.

Supporting the argument of lower European numbers, due to surplus product in the market, is the series of completed maintenance turnarounds. Montedipe recently increased output at its Montova plant by some 150,000 ton/year, bringing its nameplate capacity to 500,000 ton/year. Although the plant is back up, it is not thought to b working at full capacity, due to the avai lability of ethyl benzene and the tim it takes to commission the plant fully

Orkem has also completed a catalys change at its 210,000 ton/year Carlin plant. Atochem's 350,000 ton/year Gon freville unit is now working flat out and adding to the perception of a longer market. Some observers feel European producers may be discreetly selling into the market, hence the lower numbers, but this is yet to be confirmed.

European producers admit the maintenance season is now complete, so in theory availability should have increased. However, the latest turnarounds on France and Italy have yet to see the plants reach nameplate capacity, so undermining the long market scenario. The current upward movement in benzene prices is cited as another reason why styrene prices should hold up.

Changes in the Far Eastern market are having a noticeable effect on global styrene prices. From the low point of $560/ton cif Far East in the summer, prices have firmed to the current level of $640-650/ton cif Far East.

One factor causing the stronger numbers has been the extended turnarounds suffered by Japanese producers. Mitsubishi Petrochemicals' 260,000 ton/year plant and Idemitsu's 100,000 ton/year plant, where both due in October. Both re-commissionings have been delayed. with no new date being given

It is tacitly recognized by some producers that a tiered price system exists. Product due for export to the Far East is being sold at around $580/ton fob NWE, which works out at around $640/ton cif NWE.

It is recognized that if European sellers wish to remain competitive in the Far East, they have to offer reasonable numbers.

Environment

WEST ASSISTS EAST WITH POLLUTION PROGRAMME

Western Europe is investing in pollution control in Eastern Europe in order to protect the common environment. Sweden has announced a $45m research, training and technology transfer programme for Poland intended to rescue the Baltic Sea from the effects of an ecological catastrophe. The programme will promote collaboration between many industries and scientific and technological research establishments in the two neighbouring countries.

Many similar technical assistance programmes linking Eastern and Western Europe are likely to follow, fostering collaboration in scientific and technological research and training.

"Poland's enormous environmental problems are badly hitting the local population," explains Lena Hjelm-Wallen, the Swedish minister for international development cooperation, "but they are also affecting us through transboundary pollution."

Similar sentiments were expressed by West Germany earlier last year when it announced a project to help East Germany to tame its underfunded chemical industries from polluting Europe's seas.

Such environmental assistance is in the direct interest of the West, comments the Washington-based Worldwatch Institute in an important recent discussion paper, "since it is easier to stem pollution at source than to clean it up when it blows over the border." The widening programme involves collaboration in the chemical industry as well as reserch, training and investment. It may well affect health standards throughout continental Europe.

International cooperation for pollution control is to be promoted and coordinated in a big way by the EC's projected environment protection agency, expected to be established very soon.

Aggressive industrialization and rigid planning applied since the Second World War have made the Eastern block one of the world's most heavily polluted regions. The extent of the damage is just beginning to be officially admitted. The worst affected countries are Poland, East Germany and Czechoslovakia. A study issued by the Polish Academy of Sciences estimates the minimum losses due to environmental pollution at 10 per cent of the country's annual gross national product. The study describes about half of Poland's total water resources as unfit for even industrial use; and it acknowledges that " the balance of nature has collapsed in more than 10 per cent of the countryside."

Similarly devastating authoritative assessments are being published, sometimes still in the face of official disapproval, throughout the region. East Germany reckons that its industry emits about 5m. ton/year of sulphur dioxide into the atmosphere, more than any other country in Europe. The Czechoslovakian Academy of Sciences estimates the national cost of acid pollution at $1.5bn/year.

Sweden is particularly concerned with the effect of chemical pollution transported by the Vistula river into the Baltic. Once known as the queen of Poland's rivers, the Vistula collects the wastes of many industries as it sweeps across the country from the Carpathian mountains in the south to the sea in the north. The river accounts for two-thirds of the 132,000 ton/year of nitrogen entering the Baltic. It also deposits 5,000 ton of phosphorus and 3 ton each of highly toxic phenol and lead as well as unspecified quantities of mercury, cadmium, zinc and other heavy metals. The bay of Gdansk, the biggest city on Poland's Baltic coast, is satura chemical wastes from the Vi

Poland has launched an a programme to clean up the building some 188 large wate cation plants for the treatment ipal sewage and industrial w well as 200 smaller plants fo toxic chemical wastes. Many d government's ability to raise in t seeable future the $1bn neede project.

Sweden meanwhile has inv concerned industries, universiti other specialist agencies and aut in both countries to suggest wa improving collaboration in po control under the new three-year eral programme. East and Wes many are also joined in a new thre chemical waste control programm reduce pollution of the Elbe rive which an estimated 27m ton/yea mercury is dumped, and the Ba Their research, training and techn transfer programme worth about three-quarters of it funded by W Germany, provides for the erectio advanced coal burning faciliti power stations and incinerators fo disposal of chemical and pharma cal wastes.

The US and the Netherlands ar viding some additional economic as tance to Eastern Europe for pol control. Some multilateral aid is av able from the World Bank an United Nations Development gramme.

The focus of East-West coop in the area is the UN Economi mission for Europe.

A collective approach to con pollution throughout Europe promoted by a new environment tion agency to be established by under legislative proposals prep the council of ministers for app the European parliament.

ews about new projects

RMS DETAIL
ROPOSALS

nies in Brazil have
of proposed investment
s Itaguai complex and
nga has disclosed plans
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olisul, jointly owned by
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Gouveia Vieira, manager
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should reach 184,000
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le, at Triunfo, Polisul is
$55m investment aimed at
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Triunfo. It has detailed a
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supply the technology. It
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s acetone derivatives busi-
then to select available
es for acquisition. Petroclor, the 55/45 joint venture between Petropar holding and Solvay's Electro Cloro, has received conditional approval from the Industrial Development Secretariat (SDI) for its $450m investment project at Triunfo.

According to an SDI spokesman, the requirements imposed do not represent an additional onus for Petroclor. The company has to agree not to get involved in any new petrochemical projects until the SDI considers the Triunfo investments are irreversible. If this agreement is broken, Petroclor's associates could not apply for financial incentives or soft credits for an unspecified period of time.

The SDI has imposed the requirements to clear up what the government considers a risky investment proposal which may wreck the medium-term feasibility of Petroclor's plans. The proposed VCM/PVC facility would have a capacity of 180,000 ton/year.

EDN is to put forward to the SDI a $180m investment proposal for an ethylbenzene/styrene monomer/PS project at Itaguai. It would have capacity for 240,000 ton/year ethylbenzene, 150,000 styrene monomer and 50,000 ton/year PS.

EDN's chairman says the company is becoming a major player in the Brazilian market. It already operates facilities at Camacari for 170,000 ton/year ethylbenzene, 150,000 ton/year styrene and 50,000 ton/year PS. In addition, at Guaruja, Sao Paulo State, EDN has a 75,000 ton/year PS plant using feedstock from Camacari. EDN obtains the project at Itaguai, the company says supply to Guaruja would be simplified.

Also, the 240,000 ton/year ethylbenzene capacity would be able to supply Petroflex, which uses the same feedstock and is expanding its synthetic rubber capacity at Rio.

CARBIDE FORMS OXO VENTURE

Union Carbide Brasil Ltd. and Elekeiroz do Nordesto Industria Quimica SA (Eniq) are to form a joint venture to produce oxo chemicals at a new plant in Camacari, Bahia state, Brazil.

The new project is to be known as Elekeiroz da Bahia SA and will produce butanols and 2-ethylhexanol using a flexible capacity system which allows the amount of each chemical produced to vary. The facility will have a nominal capacity of 80,000 ton/year.

The plant will utilize the Union Carbide/Davy-McKee/Johnson-Matthey low-pressure oxo technology which is licensed for worldwide use, and incorporate the most recent developments within the process. It is expected to go into production by mid-1992.

Product from the facility is intended for both the domestic and export markets, with Union Carbide Brasil, a subsidiary of Union Carbide Chemicals and Plastics Co. Inc. (UCC&P), dealing with the marketing of exports and Eniq, a subsidiary of Brazilian company Investimentos Itau SA. (Itausa), providing domestic marketing services, The combined investment in the joint facility amounts to $160m, with Eniq holding the majority interest. "Itausa intends to make the necessary investments in the chemical industry to participate in the growth forecast for chemicals for the next five years," said Olavo Setubal, Itausa's Chairman.

WEATHERLY PICKS UP NITRIC AWARD

Weatherly Inc. has been awarded a contract to design and provide equipment for a nitric acid (65 per cent weight) facility for First Chemical Corp, a wholly-owned subsidiary of First Mississippi.

The plant is to be situated in Pasca- ula, Mississippi, and will have a pacity of 77,000 ton/year. It is sche- led to go on-stream in January 1991.

Weatherly is a wholly-owned subsid- y of Chematur International AS of arlskoga, Sweden. It specialises in ration technology, including fertilise- s and nitric acid. Its nitric acid facil- es utilize the company's unique ono-pressure vertical design and by 991 the Pascagoula plant will be the ghth such unit to go into production.

The company's technology is already sed in one such facility in Mississippi, long with two others in Israel and ustralia. Four other plants are currently nder construction; one in Indonesia cheduled to go on-stream in February 990, plus two in India and one in South Korea, all of which are expected to go nto production in October 1990.

DU PONT EXPANDS US NYLON UNITS

In the latest step in its ongoing expansion programme, Du Pont has announced plans to expand nylon polymers capacity and compounding facilities at its Parkersburg, West Virginia plant. Total expansion of the two plants will be around 45,000 ton/year at a cost of around $50m, said a company spokesman.

Du Pont says the move will enable it to improve its ability to meet increased world demand for nylon, acetals and polyesters, as well as to provide more specialized compounds on short notice.

The investment includes a series of expansions by the company in Europe and Asia, as sources say that demand for engineering polyme approximately 8 pe Europe and by ano Asia.

EMS-INVENTA SI NYLON-6 DEAL

Ems-Inventa AG supply a SF73m ($2 ity for Thai Taffeta will be located near have a capacity to pro year of nylon-6 filame duled to go on-stream

EMS-Inventa is to b only for the design an the new plant, but also and delivery of equipm ing of personnel. It w construction work on supervise its start-up

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Director M. Ta-
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supply capacity in proportion to actual demand for the product. I hope they will work out an adequate business plan for ethylene derivatives and push ahead with the project in a manner that does not hinder the healthy progress of Japan's petrochemical industry."

CHEMICAL PRODUCT DECLINE SEEN FOR 2ND HALF OF 1990

Economic Planning Agency has issued a report following a round-table meting held mid-November 1989 on general business conditions, with economic organizations representing 11 different sectors, including trading and electronics concerns. According to the report, Japanese trading firms may see domestic consumption of chemical products, which has been on the rise, slowing down during the second half of 1990. It also predicts an increasing dependence on the Middle East as an oil source. Along with changing expectations of industry and economic management, people are calling on the government to take action regarding Japan's recently introduced consumption tax, maintain the current level of economic expansion, and adjust import tariffs to promote imports of finished products.

The report containing summaries for industry as a whole is divided up by business sector. The viewpoint of the trading firms which attended the meeting merits some attention, focussing as it does on a possible slowdown in the previously increasing Japanese consumption of chemical products, in particular. Regarding exports: despite instability in China, exports to the country are expected to increase in the latter part of 1990. Regarding energy: as already deep-rooted needs continue increasing, Japan's imports of petroleum products and liquid natural gas are expected to increase, along with dependence on the Middle East for crude oil. Regarding cement: just as increases were forecast for 1989, cement should see a demand rise in 1990, following high demand in the private sector. Regarding textiles: other than ladies' knitwear, this area is expected to enjoy generally robust demand. Domestic production is likely to be sluggish in the face of rapidly increasing imports.

RESEARCH ON ULTRALARGE-SCALE PROJECTS KICKED OFF: MITI AGENCY

MITI's Agency of Industrial Science and Technology has commissioned private research organisations with studies on ultralarge-scale projects covering environmental problems, remedies for cancer and AIDS, energy supply, promotion of scientific technology throughout the world, establishment of international data bases and construction of large-scale research facilities, etc.

The agency expects the projects to help improve social systems and foundations for people's lives and solve world-wide problems. The said studies will be completed by March this year and the said private organisation will select themes suit able for the projects: the themes will be screened by an ad hoc committee attached to Industrial Technology Council – an advisory panel to the International Trade and Industry Minister. The committee will compile an interim report shortly.

High hopes are placed on Japan's technical contribution to the world community since she has come to hold topnotch industrial technology and its economy accounts for a little over 10% of the world economy. The agency feels the necessity of Japan's working out ultralarge-scale projects in a bid to promote the world's scientific technology and settle global problems.

AGROCHEMICAL DELIVERIES SHOW NEGATIVE GROWTH FOR 3RD STRAIGHT YEAR

Demand for agrochemicals showed a year-to-year decrease for the third straight year in the 1989 pesticide year. Society of Agricultural Chemical Industry (Japan) recently issued a report on agrochemical deliveries in the 1989 pesticide year. According to the report, volume recorded 455,091 tons and value, ¥361,688 million, falling 5.4 and 0.3% from the previous year, respectively.

Agrochemical deliveries showed negative growth in the 1987 pesticide year for the first time in history and the 1989 pesticide year's year-to-year decrease was the third in a row. The cost decrease came about mainly because of the government's rice-acreage-reduction policy, generally few occurrences of diseases and pests, price reduction enforced for the third consecutive year and rising public opinion favoring minimal use of agrochemicals. In particular, deliveries of paddy-field agrochemicals -- a major item among agrochemicals -- decreased sharply especially around western Japan. The society says that agrochemicals demand is not likely to increase steeply in the future either. (See table).

Agrochemical deliveries in 1989 pesticide year (in tons, kl, %, ¥1 million)

	Volume	PY 89/PY 88 %	Value	PY 89/PY 88 %
Paddy field				
Insecticides	82,742	83.4	33,546	89.3
Fungicides	48,078	97.8	29,550	101.7
Insecticide-Fungicides	55,262	90.5	22,990	92.9
Herbicides	108,036	97.5	64,472	102.7
Subtotal	294,118	91.8	150,558	97.7
Fruit trees				
Insecticides	17,701	101.3	26,515	102.1
Fungicides	16,743	94.2	26,395	105.9
Insecticide-Fungicides	43	113.2	148	111.3
Herbicides	4,605	98.9	11,384	103.6
Subtotal	39,092	97.9	64,442	103.9
Vegetables/upland crops				
Insecticides	51,638	99.0	50,102	98.3
Fungicides	24,841	105.7	35,479	103.8
Insecticides-Fungicides	2,554	96.5	1,248	104.5
Herbicides	23,745	101.2	23,217	100.4
Subtotal	102,778	101.0	110,046	100.5
Others	19,103	95.6	36,642	98.3
Total	455,091	94.4	361,688	99.7

STYRENE MONOMER EXPORTS TO SOUTH EAST ASIA RISE SHARPLY

Exports of styrene monomer (SM) are going through the roof. The total for the first 10 months of this year comes to 150,000 tons, already nearly doubling the 80,000 ton figure achieved for the whole of last year. Japanese producers managed to keep up with this expansion by "debottlenecking" operations and reactivating mothballed furnaces. This, along with a steady decline in international market prices, and a healthy rise in demand for polystyrene and ABS resins (important demand sectors for styrene monomer), have all been contributing factors in this rema in exports to the Southea market.

Among the countries inclu are South Korea, Taiwan, h and Thailand, which togethe for over 20,000 ton/month o age. The forecast total for the is around 200,000 tons. In rel unusually tight short term s supply, the international mark slack, and spot prices in partic lapsed. This happened in part d drop in prices for raw materia lene and benzene, also becau world's suppliers, Japan esp were ready to expand to off crunch. With fears of an unstab diminishing, spot prices declin through the summer.

In Japan, Idemitsu Petrochemi Mitsubishi Petrochemical both s off by putting mothballed furnace on line, then streamlining produc cope with the needed expansion duction last year. Other manufac followed suit. This left them with e export capacity. In Southeast Asi use of polystyrene in home applia and packaging materials especial been growing steadily. Production ABS resin has been on the ris Taiwan, and there have been some blems in South Korea. All of these contributed to the rapid increase demand for styrene monomer. A same time that the market regains so stability, signs of a year-end price and other hints of rising prices cause demand get out of hand a year's end. It was these circumsta that served as a background fo year's rising exports in styrene mer, which levelled off at an avera 20,000 tons/month. The result of that exports for the period Janua October broke the 150,000 ton le almost doubling 1988 figure. Ov demand should remain as strong maintaining the 20,000 tons/m level, for an annual figure clo 200,000 tons.

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THREE-YEAR DEEP-SEA BIOSCIENCE PROJECT WORKED OUT: GOVERNMENT AGENCY

Science and Technology Agency is scheduled to inaugurate next fiscal year a three-year project aimed at promoting research on deep-sea life having unique properties. The agency plans to develop several types of equipment designed to gather deep-sea microorganisms and carry them to land while maintaining the deep-sea pressure they are accustomed to, and separate and cultivate them under the same conditions as in the deep sea.

It is believed that living things in the deep sea include chemical-synthesis germs capable of taking in hydrogen sulfide and hydrocarbon without employing a photosynthesis process. Many of the germs have been found at the deep-sea bottom where hot water is being spouted. It is thought that they must conduct unique chemical reactions and have metabolic functions completely different from those of life on the ground. Elucidation of their functions is expected to result in the discovery of new enzymes and physiologically active substances, thereby facilitating production of new pharmaceuticals and improvement of industrial processes.

For example, it may be possible to develop new pollution-control technology by taking advantage of deep-sea microbes' resistance to heavy metals. The said project will encourage research on "deep-sea bioscience," which calls for the establishment of the same circumstances as in the deep sea. It is quite difficult to carry out such research using only conventional facilities including submarines.

UNIQUE JAPANESE PURE-TI TOOTH ROOT TO BE ON MARKET FOR 1ST TIME

Toho Titanium company will soon market a tooth root made of pure titanium and designed to shorten the period required for dental treatment. It will be the first titanium-made biomimetic material to be supplied by a Japanese firm. The new product dubbed "Ti-ROOT" has its bottom tip made porous so that the living tissue in which the tooth root has been implanted can enter its pores to catch it firmly. This helps to shorten the period needed for dental treatment compared with the case of using conventional titanium roots without such pores, the company says.

Clinical tests at a hospital show good results and the company has built production facilities for the artificial tooth root at its Chigasaki factory to prepare for commercial production as it is likely to obtain manufacturing approval for it soon. Titanium is light (its specific gravity is less than one-half that of iron) and has a very high strength-to-weight ratio. It also has a good anticorrosive property and so is a good biomimetic substance to be implanted in the body.

In Japan, Sumitomo Metal Industries, Ltd. which is producing expanded titanium products has developed a titanium tooth root and several other companies are also carrying out R&D on the tooth root. None of them, however, have started commercial production as yet.

RESEARCH ON "INTELLIGENT MATERIAL" SHOULD BE STEPPED UP: REPORT

Aircraft/Electronics Technology Council recently compiled a report on R & D for "intelligent material." In this report, "intelligent material" is defined" as "material capable of responding to changes in circumstances." The council claims that intelligent materials include sensors, electronics materials --both of which are capable of forming adequate "judgements" in response to stimulation - and capsules designed to release drugs depending on the physical condition of those who have taken them.

It recommends that studies be conducted on how to develop basic functions of responding to changes in circumstances and combine them in a single material. Current research on high-tech materials is aimed at making targeted material perform only a single function.

It also advises that the functions be materialized on an atomic/molecular basis as a first step. It is necessary, the council adds, to conduct research on intelligent material based on the following: (1) promotion of all-round R & D work, (2) increase in the number of related researchers and promotion of information exchange among them, (3) development of related fundamental technology and (4) international cooperation. The report refers to "the government's positive approach" toward development of intelligent-material technology regarded as a promising one for the coming age. Science and Technology Agency intends to embody the content of the report in government policies.

POLYMER TURNED HYDROPHYLIC THROUGH GRAFT POLYMERIZATION

A research group at College of Engineering, Kyoto University has succeeded in turning hydrophobic polymer -- poly (1-trimethylsilyl-1-propyne) film -- hydrophylic by adding hydrophylic monomer (acrylic acid) thereto using photo- and plasma- initiated graft-polymerization processes.

Gas and dissolved oxygen are capable of easily passing through the polymer developed by the research group. The polymer is, however, originally hydrophobic and studies have hitherto been conducted on how to turn the product hydrophylic. The technical breakthrough attained by the research group will expand application of the promising polymer -- usable as an oxygen-enriching film --

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sale)	70.00
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er (33% Cl)	4.20

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Bisphenol-A	70.00
Butyl carbitol	110.00
Caustic soda (Flakes)	11.00
Caustic soda (Solid)	12.00
Caustic soda (Lye)	10.00
Calcium chloride 70% (Solid)	3.25
Calcium chloride 75-80%(fused)	3.50
Calcium chloride 36% (Anhydrous)	5.00
Calcium carbonate (precipitated)	4.25
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Cresylic acid	62.00
Camphor (Indian)	105.00
Cream of Tartar (Tech.) China	70.00
Citric acid (Belgium) (Resale)	47.00
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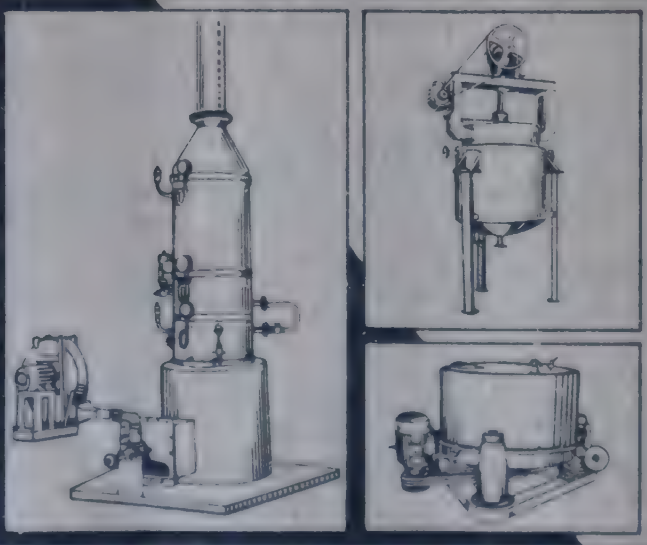

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Para Anisidine (PA
PNA
Para Cresidine (Imp.)
Para Amino Azo Benz
(India)
PNCB
Para Amino Acetanili
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5-Pyrazolone
Phenyl J. Acid
Para Amino Benzoic A
PT Base
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Resist Salt 80%
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Madras Market

Prices maintained previous levels without much change in the Madras chemicals market. Titanium dioxide rutile was quoted at Rs. 108 per kg but with very little business done. Enquiries for xylene, toluene and acetone were good and there was moderate activity in these items.

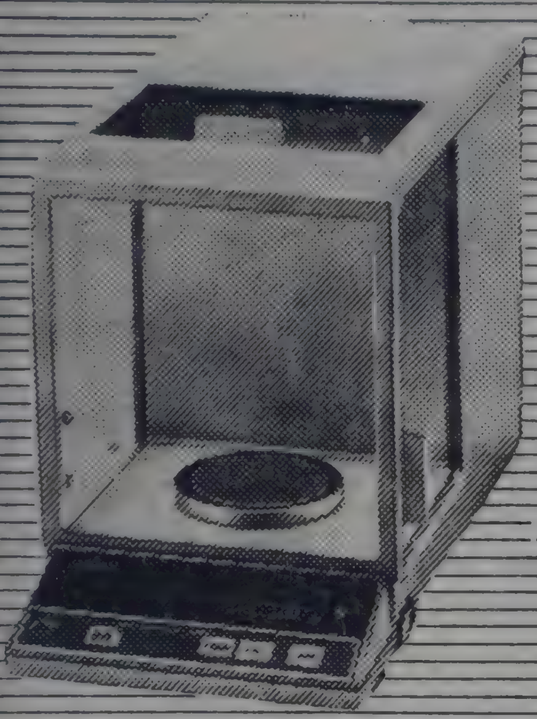
(MADRAS MARKET RATES AS ON JANUARY 13, 1990)

Acetic Acid Glacial (per kg)	15.00
Aluminium Sulphate Iron free (per MT)	4,000.00
Ammonium Bicarbonate (per 25 kgs)	150 00
Ammonium Chloride (per MT)	3,000.00
Acid Slurry (per kg)	31.50
Barium Carbonate (per kg)	9.00
Barium Chloride (per kg)	8.00
Boric Acid Technical (per kg)	24.00
Bleaching Powder (per 50 kgs)	225.00
Borax (per 50 kgs)	700.00
Caustic Soda Flakes – Mettur Chemicals (per MT)	10,500.00
Caustic Soda Flakes – Andhra Sugars (per MT)	10,500.00
Calcium Chloride 70% Solid (per MT)	3,000.00
Calcium Chloride Anhydrous (per MT)	5,500.00
Calcium Carbonate (Activated) (per MT)	6,000.00
Calcium Carbonate (Precipitated) (per MT)	5,000.00
Citric Acid (per kg)	48.00
Copper Sulphate (per kg)	24.00
Cresylic Acid 98-99% (per kg)	130.00
Pure Para Cresol 96% (per kg)	90.00
Meta Para Cresol 42% (per kg)	50.00
Formic Acid (per kg)	26.00
Formaldehyde (per kg)	8.00
Glue Flakes (per kg)	15.00
Glycerine I.W. (per kg)	48.00
Hydrosulphite of Soda (TCPL) (per kg)	36.00
Hydrosulphite of Soda (IDI) (per kg)	40.00
Hydrosulphite of Soda (BASF) (per kg)	40.00
Hexamine (per kg)	31.00
Hyflosupercell (per kg)	19.50
Hydrogen Peroxide (per kg)	31.50
Litharge (per kg)	40.00
Lead Acetate (per kg)	40.00
Magnesium Carbonate (per kg)	18.00

Magnesium Chloride (per kg)
Maleic Anhydride (per kg)
Menthol Crystals (per kg)
Oxalic Acid (per kg)
Paraffin Wax (per kg)
Potassium Bichromate (per kg)
Phosphoric Acid (per kg)
Polyvinyl Alcohol Powder (per kg
Pentaerythritol (per kg)
Phthalic Anhydride (per kg)
Soda Ash (TAC) (per 75 kgs)
Soda Ash (TATA) (per 75 kgs)
Sodium Bicarbonate (TATA) (per 50 kgs)
Sodium Silicate (per MT)
Sodium Bichromate (per kg)
Sodium Nitrate (per kg)
Sodium Nitrite (per kg)
Sodium Sulphide Flakes (per kg)
Sodium Bisulphite (per kg)
Sodium Alginate (per kg)
Sodium Acetate (per kg)
Sodium Sulphate (Anhydrous) (per
Titanium Dioxide (Anatase) (per kg
Titanium Dioxide (Rutile) (per kg)
Trisodium Phosphate (per kg)
Urea (Technical) (per kg)
Zinc Oxide (per kg)
Zinc Chloride Powder (per kg)
Zinc Sulphate (per kg)

SOLVENTS

Acetone -- HOCL (per kg)
Butanol (per kg)
Butyl Acetate (per kg)
Benzene (per lit)
Cellosolve (per kg)
Carbon Tetra Chloride (per kg)
Chloroform (per kg)
Diacetone Alcohol (per kg)
Diethylene Glycol (per kg)
Dichloroethane (per kg)
Di-octyl Phthalate (per kg)
Di-N-butyl Phthalate (per kg)
Ethyl Acetate (per kg)
Isopropyl Alcohol (per kg)
Methanol (per kg)
Methylene Chloride (per kg)
Methyl Ethyl Ketone (per kg)
Methyl Isobutyl Ketone (per kg)
Phenol (per kg)
Sorbitol (per kg)
Triethanolamine (per kg)
Trichloroethylene (per kg)
1-1-1 Trichloroethane (per kg)
Turpentine (per lit)
Toluene (per lit)
Xylene (per lit)



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SEASONS/BCL/213R

Delhi Market

DELHI: JAN. 12, (NNS) Mercury jumped up sharply by Rs. 900 and touched a new peak level of Rs. 11,900 per flask in the Delhi chemicals market during the week under review on account of negligible stock in the market as well as higher advices from Bombay says NNS. As a result of supply being stopped by the Modis and on account of the heavy demand by stockists, caustic soda flakes spurted sharply by Rs. 60 at Rs. 535/50 kg.

In view of the dwindling supply, camphor powder and thal rose by Rs. 1/2 at Rs. 95 and Rs. 104 per kg. In the wake of fall in arrivals from Sambhal, Muradabad, Rampur, Chandausi and Amroha areas of U.P., menthol medium and bold rsoe by Rs. 15 each at Rs. 390 and Rs. 405 per kg. Menthol flake also recorded a rise of Rs. 10 at Rs. 362 due to shortage of stock. Menthol oil moved by Rs. 8 at Rs. 260/280 and DMO quoted higher at Rs. 125 instead of Rs. 120.

On reports of arrival of about 800 tonnes of imported quality from Bombay, chatkolite suffered a steep fall of Rs. 6 at Rs. 56 per kg due to lack of consumption. In the last week of Nov. 89 the prices of this commodity were quoted higher at Rs. 90. Sufolite lost Rs. 2 due to sufficient stock and poor support. Rangolite also came down further by Re. 1 in the absence of demand from textile units.

Boric acid technical and tartaric acid France declined by Rs. 50/100 at Rs. 1,350 and Rs. 13,600 per 50 kg in the absence of demand. As a result of fall in demand from plastic and paint units, titanium dioxide anatase and RC-822 moved down again by Rs. 1/3 at Rs. 81 and Rs. 95. K brand also softened by Re. 1 at Rs. 74. RCR-2 sold higher at Rs. 105 against Rs. 110 per kg due to slack enquiries. No variation was noticed in most of the dyes and colours during the week for want of support.

(DELHI MARKET RATES AS ON JANUARY 12, 1990)

Ammonia Bicarb (Per 25 Kg.)	140.00	Rangolite (Per Kg.)	83.00
Mercury (Per flask)	11,900.00	Tartaric acid (Imp) (50 Kg.)	13,600.00
Soda ash (Per bag)	340/346.00	Sufolite (per Kg.)	70.00
Ammonium Chloride (50 Kg.)	110/180.00	Chatkolite (per Kg.)	56.00
Caustic soda flakes (50 Kg.)	535.00	DMO	125.00
Citric acid (Per 50 Kg.)	2,050/2,350.00	Boric acid Technical (Per 50 Kg.)	1,350.00
Stable Bleaching Powder Shriram (Per 25 Kg.)	101.00	Paraffin Wax (Per 50 Kg.)	850.00
Stable Bleaching Powder KCl (Per 25 Kg.)	90.00	Tartaric Acid (Indian Per 15 Kg.)	4,150.00
Stable Bleaching Powder Maruti (Per 25 Kg.)	90.00	Borax Granular (Per 50 Kg.)	835.00
Stable Bleaching Powder Modi (Per 25 Kg.)	92.00	Borax Crystal (Per 50 Kg.)	835.00
Sodium Bicarbonate (50 Kg.)	285/290.00	Sodium Nitrite (Per 50 Kg.)	800/900.00
Sodium Hydrosulphite (Per Kg.)	34.00/36.50	Sodium Nitrate (Per 50 Kg.)	450.00
		Camphor Thal (Per Kg.)	104.00
		Camphor Powder (Per Kg.)	95.00
		Menthol Bold (Per Kg.)	405.00
		Menthol Medium (Per Kg.)	390.00

Menthol Flake (Per Kg.)	
Menthol Oil (Per Kg.)	
Glycerine (Per Kg.)	
Sodium Silicate (Per quintal)	
Hexamine (Per Kg.)	
Acetic Acid Glacial (Per Kg.)	
Copper Sulphate (Per quintal)	
Formic Acid (Per Kg.)	
Formaldehyde (Per Kg.)	
Hydrogen Peroxide (Per Kg.)	
Calcium Carbonate (Per Tonne)	
Acid Slurry Soft (Per Kg.)	
Acid Slurry Hard (Per Kg.)	
Phosphoric Acid (Per 50 Kg.)	
Potassium Nitrate (Per quintal)	900/
Potassium Permanganate (Per 50 Kg.)	2,800/
Sodium Bichromate (Per 50 Kg.)	1,575/
Trisodium Phosphate (50 Kg.)	
Titanium Dioxide Anatase (Per Kg.)	
Titanium Dioxide RC-822 (Per Kg.)	
Titanium Dioxide K-Brand (Per Kg.)	
Titanium Dioxide RCR-2 (Per Kg.)	
Zinc Oxide (Per metric tonne)	42,000/
Phenol Carbolic Acid (Per Kg.)	
Carbon Tetrachloride (Per Kg.)	
Chloroform (Per Kg.)	
Sodium Sulphate (Per metric tonne)	3,400/
Naphthalene Balls (Per 50 Kg.)	
DYES & COLOURS	
Naphthol AS	175/
Naphthol ASG	180/
Naphthol ASBS	210/
Naphthol ASTR	275/
Naphthol ASOL	210/
Naphthol ASBO	195/
DIRECT DYES	
Black E. Conc.	120
Diazo Black B.T.	105
Green B	90
Blue 2-B	60
Blue 2-B 225% (JNR)	
Sky Blue FB	160/
Basic Auramine	55
Basic Rhodamine	300/
Basic Methylene Blue	100
Basic Violet	165
Basic Malachite Green	
Acid Orange	75
Congo Red H/C	75

Shipping News

VESSELS DUE IN BOMBAY FOR EXPORT LOADING

lag	Agents (3)	Will load for (4)	Approx. sailing dt. (5)
na	Seahorse	New York; Baltimore; Charleston; Norfolk. (Carting at M.O.D. No. 3).	24/1
tine V-9002)	Volkart Fleming	New York; Philadelphia; Baltimore; Norfolk; Charleston; Savannah; Jacksonville; Miami; New Orleans; Houston; Toronto; Montreal; Chicago; Atlanta; Denver; Dallas; Wilmington; Milwaukee; Detroit; Minneapolis; Memphis; Nashville; Cleveland; Phoenix; Boston; Los Angeles; Vancouver; Seattle; Sanfrancisco; Portland; Longbeach; Mexican & S. American Ports. (Carting at M.O.D. No. 2).	24/1
y-16)	Samrat/	Longbeach; Oakland; Seattle; Los Angeles; Sanfrancisco; Philadelphia; Savannah; Charleston; Baltimore; Norfolk; New York; Boston; St. John; Vancouver; Montreal; Toronto; New Orleans; Houston. (Carting at M.B.).	24/1
	U.L.A./	Los Angeles; San Francisco; Oakland; Seattle; Vancouver; Charleston; Houston; Norfolk; Baltimore; New York; Halifax; Montreal; Toronto; S. American and West Indies Ports. (Carting at M-171/173 C.D.).	24/1
	E.S.P.L./	Longbeach; Charleston; New York; St. John; Norfolk; Oakland; Vancouver (B.C.); Seattle; Montreal; Baltimore; Boston; Chicago; Dallas; Houston; Longview; Los Angeles; New Orleans; Philadelphia; Portland; San Diego; Mexico City; San Francicso; Siouxfall; Sacramento; Stockton; Halifax; Toronto; Savannah; Tacoma; Miami and all other destinations. Also Caribbean ports. (Carting at Mallet Bunder)	
	Trident/	S. American; Carribean and Central American ports. (Carting at T.P. No. 4).	24/1
	Arebee	S. American ports. (Carting at M-Jetha Cotton Depot).	
Star (V-026)	F.F.C. Co.	Los Angeles (Harbour); Longbeach; San Francisco; Oakland; Seattle; Vancouver (B.C.); Portland; New York; Boston; Norfolk; Baltimore; Charleston; Savannah; Miami; New Orleans; Houston; Montreal; Toronto; Fortworth; Chicago; Nashville; Atlanta; Philadelphia; Milwaukee; Kansas City; Phoenix; Guam; Dallas; Cleveland; St. Louis; Cincinnati; Denver; Louisville; Memphis; Wilmington (B.C.); San Diego; Minneapolis; Indianapolis and Central American Ports; Honolulu. (Carting at Timber Pond No. 1).	25/1
lidas d)	S.C.I.	New York; Baltimore; Savannah (Direct) and other inland destinations (Carting at Timber Pond No. 1).	26/1
Houston me)	M.S.P.L.	Philadelphia; Baltimore; Norfolk; New Orleans; Houston; Savannah; New York. (Carting at P/Q-PD).	1/2
lia	Merzario	Dakar; Abidjan; Monrovia; Lome; Douala; P. Noire; Matadi; Libreville; Cotonou; P. Gentil; Lagos; P. Harcourt; Warri; Freetown; Conakry; Louanda; Nouakchott; Guinea; Blassa. (Carting at M.O.D. No. 2).	25/1
	U.L.A./	Lagos/Aqapa; Abidjan; Lome/Matadi. (Carting at M171/173 C.D.)	24/1
	Trident	Tema/Lome; Lagos; Matadi; Lobito; Luanda; Freetown; Cotonou; Douala; P. Harcourt; Abidjan; Monrovia; Dakar. (Crtg. at T.P. No.4).	
sk ementine	V. Fleming	Lagos/Aqapa; Dakar; Freetown; Monrovia; Lome; Cotonou; Douala; Tema. (Carting at M.O.D. No. 2).	24/1
	Kanika	Antwerp; Rotterdam; Hamburg; Le Havre; Genoa; Gothenburg; Stockholm; Copenhagen; Oslo; Helsinki; London; Felixstowe; Tilbury. (Carting at T.P. No. 3).	24/1
e Star	F.F.C. Co.	Jeddah; P. Sudan; Hodeidah. (Carting at Timber Pond No. 1).	25/1
Houston	M.S.P.L.	Aqaba; Assab; P. Suez; (Alexandria). (Carting at P/Q-PD).	1/2
dia (Ger)	Samrat/ Hindustan/ Merzario/	Felixstowe; Hamburg; Rotterdam; Also London; Liverpool; Leixoes; Lisbon; Manchester; Avonmouth; Wembley; Birmingham; Liecester; Le Havre; Amsterdam; Bremen; Antwerp; Copenhagen; Leeds; Aarhus; Gothenburg; Oslo; Stockholm; Helsinki; Belfast and all Destinations in U.K.· Benelux Germany; Italy; France; Switzerland and Austria. (Carting at M.O.D. No. 2 for Merzario) (Carting at M.O.D. No. 1 for Samrat & Hindustan).	25/1

(1)	(2)	(3)	(4)
19/1	Maersk Clementine	Volkart Fleming	Leghorn; Marseilles; Naples; Barcelona; Bilbao; Bordeaux; Alicante; Genoa; Valencia; Bremen; Jeddah; Antwerp; Rotterdam; Bremerhaven; Hamburg; U.K. & Scandinavian ports. (Carting at M.O.D. No. 3).
19/1	Lanka Aruna (Phi)	Seahorse	Hodeidah; Jeddah; Aqaba; Alexandria (Direct); Felixstowe; London; Liverpool; Manchester; Avonmouth; Dublin; Glasgow; Wembley; Liecester; Immingham; Birmingham; Leeds; Antwerp; Bremen; Copenhagen; Gothenburg; Hamburg; Rotterdam; Oslo; Stockholm; Helsinki; Aarhus; Malmao; Norkopping. (Carting at M.O.D. No. 3).
22/1	Mareike	U.L.A.	P. Sudan; Aden; Djibouti; Hodeidah.
23/1	Chandidas (Ind)	S.C.I.	P. Said; Felixstowe; Hamburg; Rotterdam; Antwerp; Bremen; Liverpool; Le Havre; Manchester; Avonmouth; London; Belfast; Aarhus; Oslo; Copenhagen; Gothenburg; Helsinki and all inland destinations. (Carting at T.P. No. 1).
19/1	Lanka Aruna	Seahorse	Colombo. (Carting at M.O.D. No. 3).
20/1	Eagle Star	F.F.C. Co.	Colombo; Rangoon. (Carting at Timber Pond No. 1).
25/1	Kalidas	S.C.I.	Colombo; Chittagong. (Carting at Timber Pond No. 1).
18/1	Moji (V-16)	Samrat/	Singapore (Direct); Penang; Jakarta; Surabaya; Belawan; P. Kelang; Bangkok; Manla; Hongkong; Kaohsiung; Keelung; Taichung; Busan; Yokohama; Nagoya; Kobe; Osaka; Tokyo. (Carting at Mallett Bunder).
		Trident/	Busan; Hongkong; Keelung; Kobe; Nagoya; Yokohama; Penang; P. Kelang; Bangkok; Kaohsiung; Singapore. (Carting at T.P. No. 4).
		U.L.A./	Singapore; Penang; P. Kelang; Keelung; Kaohsiung; Bangkok; Busan; Jakarta; Hongkong; Japan and Chinese ports. (Carting at M-171/173 Cotton Depot).
		E.S.P.L.	Singapore; Hongkong; Bangkok; Jakarta; Kaosiung; Keelung; Penang; P. Kelang; Kota Kinabulu; Kulaubelati; Bintulu; Kuching; Labuan; Vietnam (P.R.C.). (Carting at Mallet Bunder).
		I.M.E./	Singapore; Bangkok; Hongkong; Keelung; Busan; Kobe; Yokohama; Nagoya. (Carting at Wadi Bunder No. 3).
		M.C.S./	Singapore; Hongkong; Keelung; Kaohsiung; Jakarta; Surabaya; Bangkok; Penang; P. Kelang. (Carting at H.B. No. 4 for M.C.S.).
		Kanika	Bangkok; P. Kelang; Djakarta; Keelung; Busan; Hongkong. (Carting at T.P. No. 3).
19/1	Lanka Aruna	Seahorse	Singapore; Penang; P. Kelang; Bangkok; Hongkong; Keelung; Kobe; Yokohama and FCL Only Busan; Inchon; Osaka; Tokyo; Nagoya; Kaohsiung. (Carting at M.O.D. No. 3).
19/1	Maersk Clementine (Sing)(V-9002)	Volkart Fleming	Penang; Singapore; Hongkong; Keelung; Kaohsiung; Busan; Main Japan Ports; Manila; Jakarta; Surabaya; Bangkok; P. Kelang; Chinese ports. (Carting at M.O.D. No. 2).
20/1	Eagle Star (V-026)(Cyp)	F.F.C. Co.	Penang; P. Kelang; Singapore; Bangkok; Jakarta; (T. Priok); Hongkong; Manila; Busan; Keelung; Kaohsiung; Kobe; Yokohama; Nagoya; Osaka; Tokyo; Tsingtao; Dairen; Quangzhou; Whampoa; Shanghai; Hsingkang. (Carting at Timber Pond No. 1).
25/1	Kalidas	S.C.I.	Singapore and Far East ports. (Carting at Timber Pond No. 1).
18/1	Moji (V-16)	Samrat/	Brisbane; Sydney; Melbourne; Adelaide; Fremantle; Burnie. (Carting at M.B.)
		Trident/	Brisbane; Sydney; Melbourne; Adelaide; Fremantle; Burnie; Auckland; Wellington; Lyttelton. (Carting at T.P. No. 4).
		Arebee/	Sydney; Melbourne; Adelaide; Brisbane. (Carting at M-Jetha C.D.)
		Transworld/	Sydney; Melbourne; Adelaide; Fremantle; Burnie; Brisbane. (Carting at CFS Cotton Avenue).
		Kanika/	Brisbane; Sydney; Melbourne; New Castle; Adelaide; Fremantle; Auckland; Wellington; Lyttleton. (Carting at Timber Pond No. 3).
19/1	Lanka Aruna	Seahorse	Brisbane; Fremantle; Sydney; Melbourne; Adelaide. (Carting at M.O.D. No. 3).
20/1	Eagle Star	F.F.C. Co.	Brisbane; Fremantle; Sydney; Melbourne; Adelaide. (Carting at T.P. No. 1).
25/1	Kalidas	S.C.I.	Melbourne; Fremantle; Adelaide; Sydney. (Carting at Timber Pond No. 1).
15/1	Ardal (Dan)	Mackintosh	Muscat; Dubai.

	(3)	(4)	(5)
ntine	V. Fleming	Dubai; Dammam; Muscat; Bahrain; Kuwait; Riyadh; Doha. (Carting at M.O.D. No. 2).	24/1
una	Seahorse	Dubai; Khorfakkan; Sharjah; Muscat; Dammam; Riyadh; Kuwait. (Carting at M.O.D. No. 3).	24/1
ar (V-026)	F.F.C. Co.	Dubai; Sharjah; Abu Dhabi; Doha; Muscat; Dammam; Riyadh; Bahrain; Kuwait. (Carting at Timber Pond No. 1).	25/1
(V-899)	U.L.A.	Dubai; Dammam; Kuwait; Bahrain; Riyadh; Abu Dhabi; Doha.	28/1

VESSELS DUE IN BOMBAY FOR IMPORT DISCHARGE

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alidas	S.C.I.	Australia
aestro	Sai Ship	S. America
egine	Sai Ship	Cont./Med.
ishva Mamta	S.C.I.	Cont./Med.

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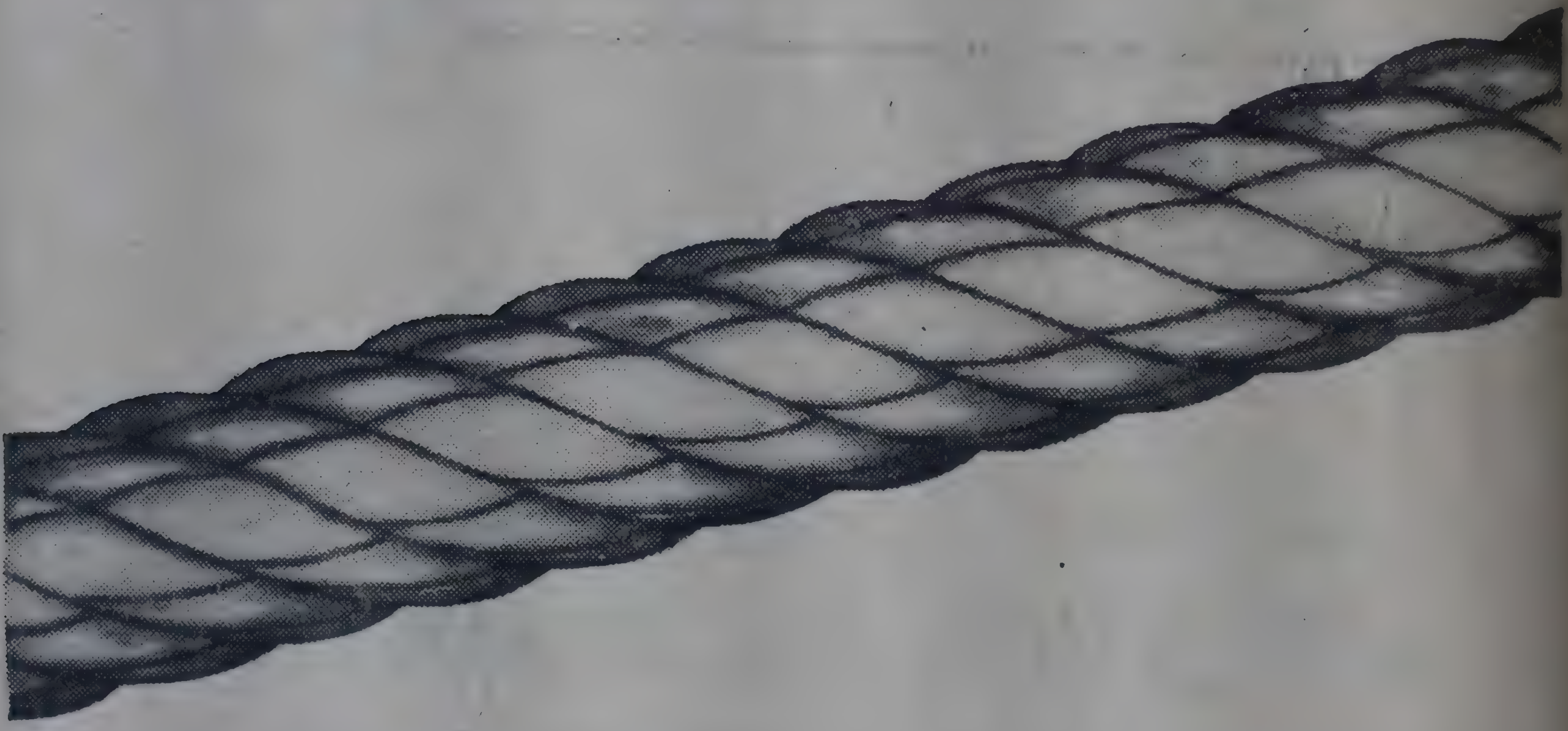

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Materials Imported

LS IMPORTED
RAS
9 to 5.12.89)
previous issue

JP: From China:
ha Pharmaceuticals
1,41,925.

G POTASSIUM:
: Benzex Labs Ltd.,
,00,701.

BP 80: From Hong
Dadha Pharm, 3,000
2.

S IMPORTED
DRAS
89 to 12.12.89)

SULPHANILYL
m Japan: Plant Organ-
., 9,06,903.

NT: From Japan:
s Pvt. Ltd., 180 Kgs.,

CHEMICALS: From
ndustrial Corpn., 1,446
192; From Japan: N.
Sons, 360 Kgs.,

TANATE: From Japan:
(Bharat) Ltd., 50 Kgs.,

TAM: From Belgium:
00 Kgs., Rs. 42,08,505

ODA FLAKES: From
Organics Ltd., 2,20,00
.511.

4-FLUORO ANILINE:
r. Reddy's Labs Ltd.,
. 7,71,206.

NE GLYCOL: From
Chem Services, 26,225
,166.

L THIODIPROPIO-
UK: SRS Filled Fibres
s., Rs. 1,21,438.

DIMETHYL DICHLOROSILANE: From FRG: Agipi Chemicals, 2,600 Kgs., Rs. 1,20,119.

4,6-DINITRO ORTHO CRESOL: From France: McDowell & Co. Ltd., 5,680 Kgs., Rs. 3,58,967.

DIPROPYLENE GLYCOL: From Thailand: Shalimar Agarbatti Co., 11,550 Kgs., Rs. 4,66,721.

DL-METHIONINE POULTRY FEED GRADE: From Japan: Oscar Feeds, 3,000 Kgs., Rs. 1,42,499.

ETHYLENE GLYCOL: From FRG: Elcot New Era Technologies Ltd., 2,200 Kgs., Rs. 63,246.

GAMMA FERRIC OXIDE: From Singapore: Prakash Pipes & Inds. Ltd., 6,000 Kgs., Rs. 5,40,159.

GUM BENZOIN: From Indonesia: B.A. Aswathiah & Bros., 200 Kgs., Rs. 30,595; From Singapore: Rasiklal and Co., 2,686 Kgs., Rs. 43,911; Shantilal Indermall, 1,355 Kgs., Rs. 18,410.

HEXYLENE GLYCOL: From Japan: Peroxides India Ltd., 1,140 Kgs., Rs. 32,822.

HYDROXY PHENYL GLYCINE: From Netherlands: TTK Chemicals Ltd., 500 Kgs., Rs. 1,87,583.

ISOCETYL STEARATE: From USA: Prakash Pipes and Inds., 353.8 Kgs., Rs. 46,594.

METHYLENE CHLORIDE: From France: TTK Chemicals Limited, 19,000 Kgs., Rs. 1,83,091; From Netherlands: Pancom Marketing Pvt. Ltd., 19.44 MTs, Rs. 42,17,798; SOL Pharmaceuticals Ltd., 19.89 MTs., Rs. 2,11,589.

PARAFORMALDEHYDE: From Spain: Bond Chemicals Corpn., 20,000 Kgs., Rs. 1,92,340.

PARAHYDROXY PHENYL GLYCINE: From Singapore: TTK Chemi-

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1. 10 HP 3 Wirm Micro Pulveriser.
2. 48" and 36" SS/MS Body and SS Basket Centr
3. 2000/2800 litres S.S. 316 Reaction Vessel (Ope
   or without anchor type stirrer.
4. Any type and any capacity Bay Boiler.

Write with full details to

BOX NO. 1189

CHEMICAL WEEKLY
306, Shri Hanuman Industrial Estate,
G.D. Ambekar Road, Wadala,
Bombay 400 031

zerland: Suflta Chemicals, 205 Kgs., Rs. 27,046.

TOLUENE DIISOCYANATE MIXTURE: From FRG: Prakash Pipes Inds. Ltd., 2,220 Kgs., Rs. 1,64,921.

TOLUENE NITRATION GRADE: From Singapore: Elgi Polytex Ltd., 14,320 Kgs., Rs. 1,30,960.

TRIETHYLAMINE: From USA: Benzex Labs Ltd., 7,560 Kgs., Rs. 2,94,328.

ZINC OXIDE: From Singapore: W.S. Industries, 18,000 Kgs., Rs. 6,52,360.

PLASTIC MATERIALS IMPORTED

MADRAS

(From 6.12.89 to 12.12.89)

HDPE: From Brazil: Jampex Enterprises, 115.75 MTs., Rs. 14,70,504; From Japan: Peacock Polymers (P) Ltd., 16,000 Kgs., Rs. 2,12,641; Rabbani Exports, 4.6 MTs., Rs. 60,522; From Netherlands: Caliph Polypacks (P) Ltd., 8.5 MTs., Rs. 1,04,366; Tamaru Associates (P) Ltd., 8.500 MTs., Rs. 1,66,366; From Singapore: Packarena Pvt. Ltd., 8,250 Kgs., Rs. 1,05,207; Swastic Corporation, 16.5 MTs., Rs. 2,24,878; Vijay Polyweaves Pvt. Ltd., 51 MTs., Rs. 6,56,055.

LDPE: From Belgium: Pramod Cane Co. Ltd., 2 MTs., Rs. 50,807; From Singapore: Indo National Ltd., 16 MTs., Rs. 2,33,034.

POLYPROPYLENE: From Japan: Electronic Research Ltd., 34,000 Kgs., Rs. 4,40,326; From France: M.V. Rubber Co. Ltd., 32,500 Kgs., Rs. 5,24,898.

POLYSTYRENE HIGH IMPACT: From Korea: Shah Polymers, 18,000 Kgs., Rs. 2,59,115.

STYRENE MONOMER: From USA: Naphtha Resins and Chemicals, 17,600 Kgs., Rs. 2,83,164.

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(From 6.12.89 to 12.12.89)

L DOPA BP 80: From Tamilnadu Dadha Pharmaceuticals Ltd., 200 Kgs., Rs. 3,61,851.

GRISEOFULVIN HP/USP: From China: American Remedies Pvt. Ltd., 250 Kgs., Rs. 1,99,328.

DYE MATERIALS IMPORTED MADRAS

(From 6.12.89 to 12.12.89)

DISPERSE DYES: From China: Nafira Leather Co., 8,000 Kgs., Rs. 3,31,930; Pharmchem Trades, 1,000 Kgs., Rs. 38,105.

SYNTHETIC ORGANIC DYESTUFF: From Switzerland: 25 Kgs., Rs. 18,600.

MATERIALS IMPORTED BOMBAY

(30.11.89)

ACRYLAMIDE: From Japan: Jaisons Impex Pvt. Ltd., 5,000 Kgs., Rs. 1,27,157; K.K. Research Centre, 15,000 Kgs., Rs. 3,81,468; Paramount Minerals & Chemicals, 1,000 Kgs., Rs. 25,431; From Sagar Paint Co., 3,000 Kgs., Rs. 76,294; Sawan Chemicals Pvt. Ltd., 2,000 Kgs., Rs. 50,863.

ADIPIC ACID: From FRG: Premier Products, 5,000 Kgs., Rs. 1,22,296.

2-AMINO 6-PICOLINE: From Switzerland: Ranbaxy Labs Ltd., 2,000 Kgs., Rs. 3,72,992.

ANILINE OIL: From FRG: Bayer India Ltd., 18,940 Kgs., Rs. 4,21,144.

AROMATIC CHEMICALS: From Switzerland: Oriental Aromatics, 170 Kgs., Rs. 42,644; The Tata Oil Mills Co. Ltd., 500 Kgs., Rs. 1,99,658.

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Inter Polymer
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PHENYL SUL
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PDI Chemical I
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FRG: Mangold
Rs. 31,686.

BUTYROLA
May & Baker
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CALCIUM SI
Greaves Foseco
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D-CAMPHO
ACID: From Fr
2,000 Kgs., Rs.

CAPROLACT
The Baroda Ra
MTs., Rs. 6,74,0
Century Enka
Rs. 77,38,719; N
& Chem Ltd., 30

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75%): From Jap
Ltd., 7,200 Kgs.

2-CYANO P
Japan: Organics
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4,000 Kgs., Rs. 2

CYCLOPROP
FRG: Cadila La
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Taiwan: Gansia
Pvt. Ltd., 360 M

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Dry Matter	%	71.0	71.0	92.0
Amino Nitrogen	%	5.5	4.2	5.5
Total Protein	%	43.0	56.0	73.5
Water Solution	5%	Clear	Clear	Clear
Copper	mg/100 gm	-	11.0	14.5
Iron	mg/100 gm	-	16.6	22.5
Vitamins				
B1	mcg/g	41.0	53.0	70.0
B2	mcg/g	25.0	36.0	50.0
B6	mcg/g	15.4	16.5	21.8
Pantothenic Acid	mcg/g	80.6	120.6	148.5
Niacin	mcg/g	[illegible]	[illegible]	[illegible]

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MONOETHYLENE GLYCOL: From Korea: Century Enka Ltd., 1,000.403 MTs., Rs. 1,29,25,555; From Saudi Arabia: Orkay Silk Mills Ltd., 500.251 MTs., Rs. 65,65,178.

NOVALDIAMINE: From FRG: Lakme Ltd., 4,785 Kgs., Rs. 16,81,086.

ORTHO AMINO PHENOL: From France: Voltas Ltd., 31,500 Kgs., Rs. 24,49,525.

PARAFORMALDEHYDE: From Spain: Greaves Foseco Ltd., 5,000 Kgs., Rs. 41,114.

PERCHLOROETHYLENE: From FRG: Shilpa Intl., 18,480 Kgs., Rs. 1,48,823; From Italy: Bharat Chemicals & Paints Inds., 18.48 MTs., Rs. 1,40,991.

D(-)ALPHA PHENYL GLYCINE CHLORIDE HCl: From Netherlands: Armour Chemicals Ltd., 5,775 Kgs., Rs. 20,89,815.

PHOSPHOROUS ACID: From FRG: Essar India Ltd., 675 Kgs., Rs. 87,393.

PIVALOYL CHLORIDE: From France: Cipham Labs Ltd., 3,060 Kgs., Rs. 2,02,984.

POLYVINYL ALCOHOL: From Japan: Kalva Chemicals Pvt. Ltd., 17,000 Kgs., Rs. 7,63,784; Marigold Coatings, 2,000 Kgs., Rs. 94,943; From Taiwan: Ballarpur Inds. Ltd., 13 MTs., Rs. 5,28,969.

PROPIONIC ANHYDRIDE: From Japan: Chemifine, 1,980 Kgs., Rs. 45,161.

PROPYLENE GLYCOL: From USA: Kushal Chand Sons, 16,770 Kgs., Rs. 3,47,491; Satyen Chemicals Inds., 17,200 Kgs., Rs. 3,49,934.

SILICON METAL: From China: Bakeri Metals & Alloys Pvt. Ltd., 2,00 Kgs., Rs. 3,56,837.

SODIUM CHLORATE: From Spain: Kepee Inds., 3,200 Kgs., Rs. 40,148.

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Phone: 2862453/2863021
Gram: "METALDIST"
Telex: 011 - 65[illegible] "INA IN

OYA LECITHIN: From FRG: Wock-rdt Limited, 1,000 Kgs., Rs. 22,236.

TITANIUM DIOXIDE: From China: letro Products India, 17.6 MTs., s. 4,89,551; From FRG: Asian Paints ndia Limited, NA, Rs. 4,74,716.

TRIMELLITIC ANHYDRIDE: rom USA: Dr. Beck & Company India imited, 36,000 Lbs., Rs. 6,86,643.

3,4,5 TRIMETHOXY BENZAL-DEHYDE 99% MIN.: From China: Parag Pharmals. India, 2,000 Kgs., Rs. 7,73,110.

TRIPHENYL PHOSPHINE: From apan: Ranbaxy Labs Ltd., 2,000 Kgs., Rs. 3,66,209.

2,4 XYLIDINE: From Switzerland: Formokem India Corporation, 1,000 Kgs., Rs. 72,286; M.B. Industrial Corporation, 2,000 Kgs., Rs. 1,44,368.

PLASTIC MATERIALS IMPORTED
BOMBAY
(30.11.89)

HDPE: From Czechoslovakia: Associated Bros., 12.5 MTs., Rs. 1,32,234; Balaji Enterprises, 7.1 MTs., Rs. 91,484; Poly Films Inds., 33 MTs., Rs. 4,39,442; From Saudi Arabia: Al Art, 99 MTs., Rs. 16,49,744; Calcutta Rope Stores, 34,300 Kgs., Rs. 4,12,884; Fortuna Agencies, 5,145 Kgs., Rs. 6,67,302; Klowin Polymers Ltd., 49.5 MTs., Rs. 5,74,873; Mayun Packs Pvt. Ltd., NA, Rs. 2,28,888, Pai Real Estates, 49.5 MTs., Rs. 5,74,872; Single Sales Corpn., 49.5 MTs., Rs. 5,74,873; Sunshine Plastic Inds., 24.75 Kgs., Rs. 2,72,750; Triveni Plastic Inds. Pvt. Ltd., 17.15 MTs., Rs. 2,23,888; Poly Art Inds. Pvt. Ltd., 99 MTs., Rs. 11,49,744; From Yugoslavia: Abhishek Corpn., 9 MTs., Rs. 1,16,493.

LDPE: From Saudi Arabia: Shashideep Enterprises, 16.5 MTs., Rs. 1,79,036; From Sweden: Universal Cables Ltd., 21 MTs., Rs. 5,75,826.

LLDPE: From Saudi Arabia: V.P.S.A. Velayutha Nadar Co., 33 MTs., Rs. 3,46,882; Fr New Plastomers Ind MTs., Rs. 5,16,126; P Private Limited Rs. 5,16,127; Sanghavi Rs. 10,23,848.

MDPE: From France maceuticals Ltd., Rs. 80,193.

PVC RESIN: From Age Chem Private Lim Rs. 12,76,180; From Me 16,650 Kgs., Rs. 2,04,4 & Chemicals Ltd., Rs. 10,08,125.

POLYETHYLENE Vindhya Telelinks Ltd Rs. 2,76,162.

POLYPROPYLENE Videocon Intl. Ltd., Rs. 4,43,731; From US Wall Ropes Ltd., 2 Rs. 31,09,802.

POLYSTYRENE: F Ashoka Enterprises, Rs. 2,50,103; H. Juendral 17 MTs., Rs. 2,53,633; P 45.51 MTs., Rs. 7,51,413 Pvt. Ltd., 51 MTs., Rs. 7 Shankar Inds., 34 MTs., F The Supreme Inds. Ltd. Rs. 14,57,743; Uniline Plas MTs., Rs. 15,03,084.

POLYSTYRENE HIGH From Korea: Xpro India Rs. 11,96,114.

STYRENE MONOM Saudi Arabia: Apar Ltd. Rs. 23,67,646.

DRUG MATERIALS IM
BOMBAY
(30.11.89)

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- Mono Potassium Phosphate
- Di Potassium Phosphate
- Tetra Potassium Pyro Phosphate
- Mono Calcium Phosphate
- Mono Ammonium Phosphate Pure
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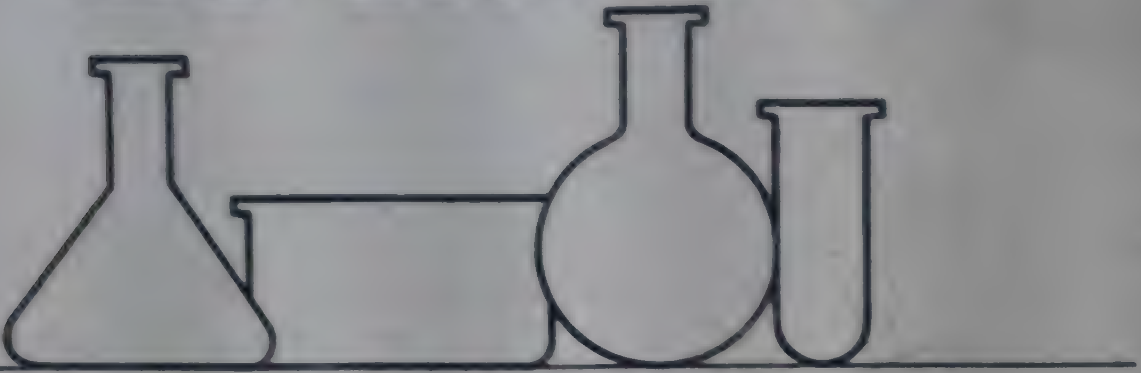

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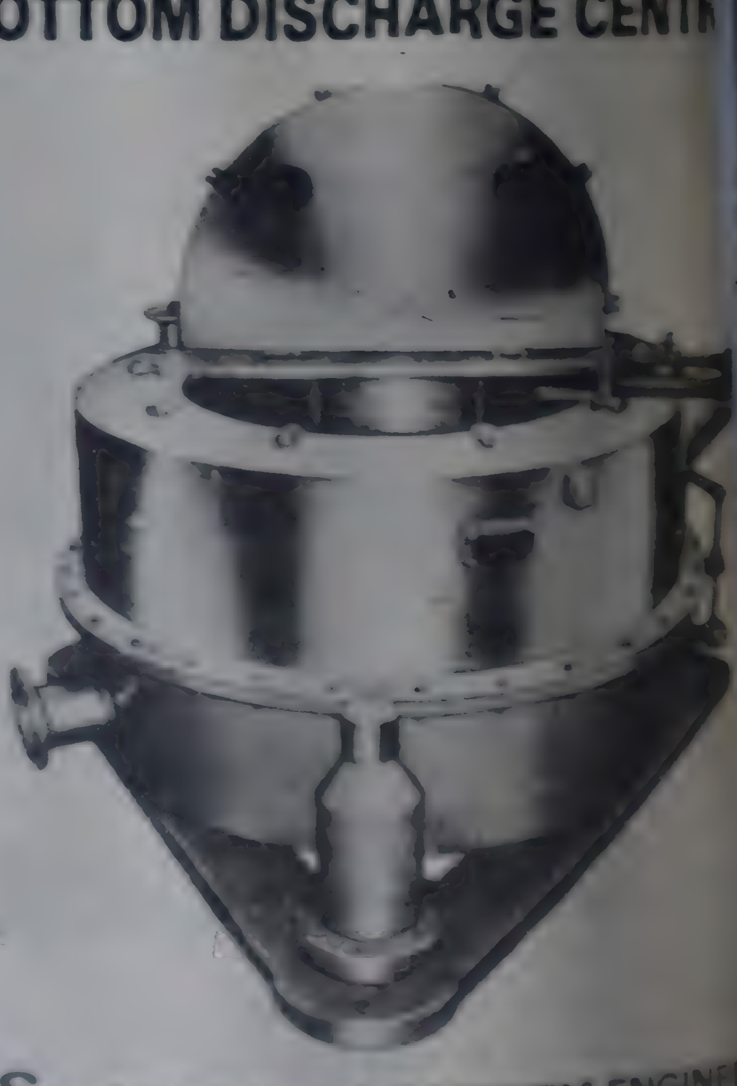

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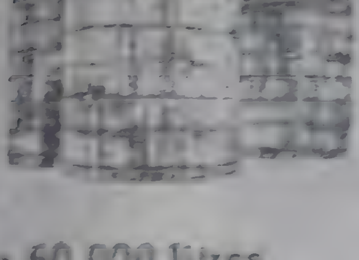

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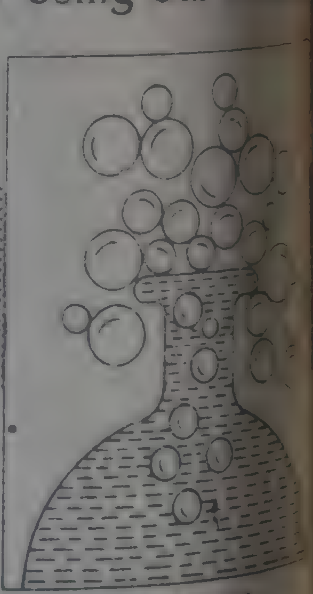

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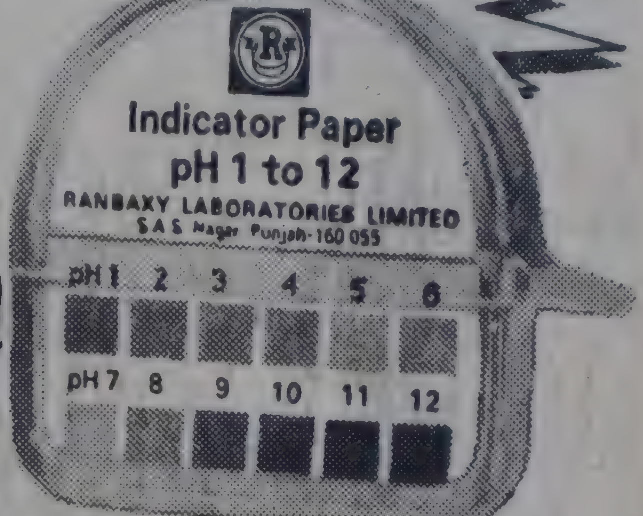
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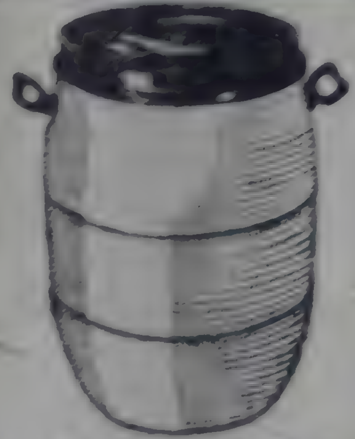
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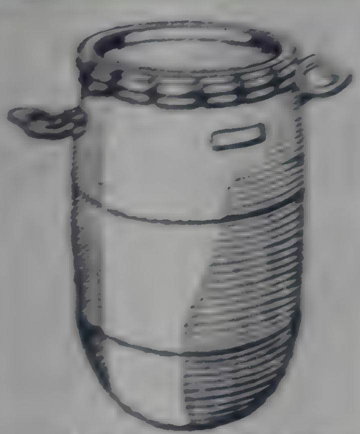
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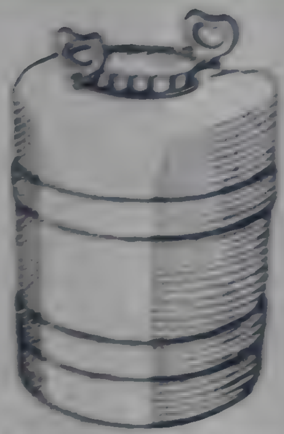
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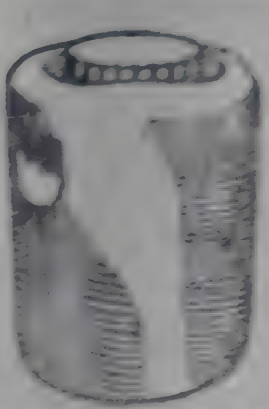
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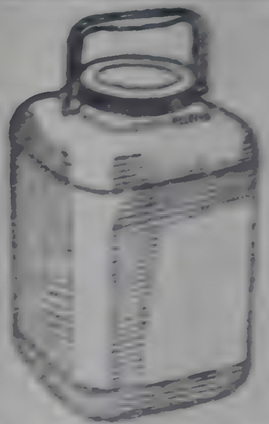
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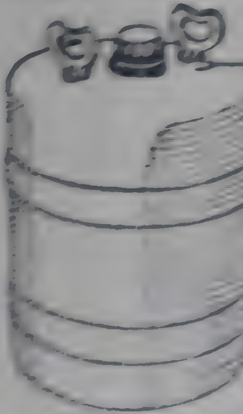
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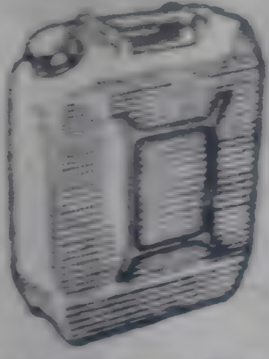
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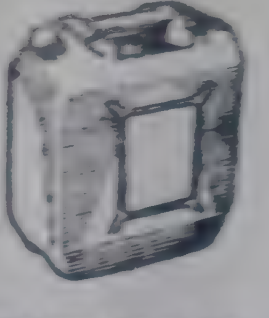
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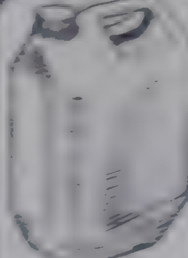
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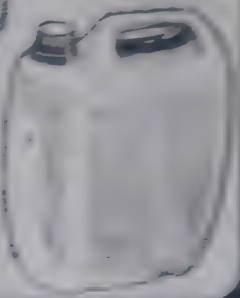
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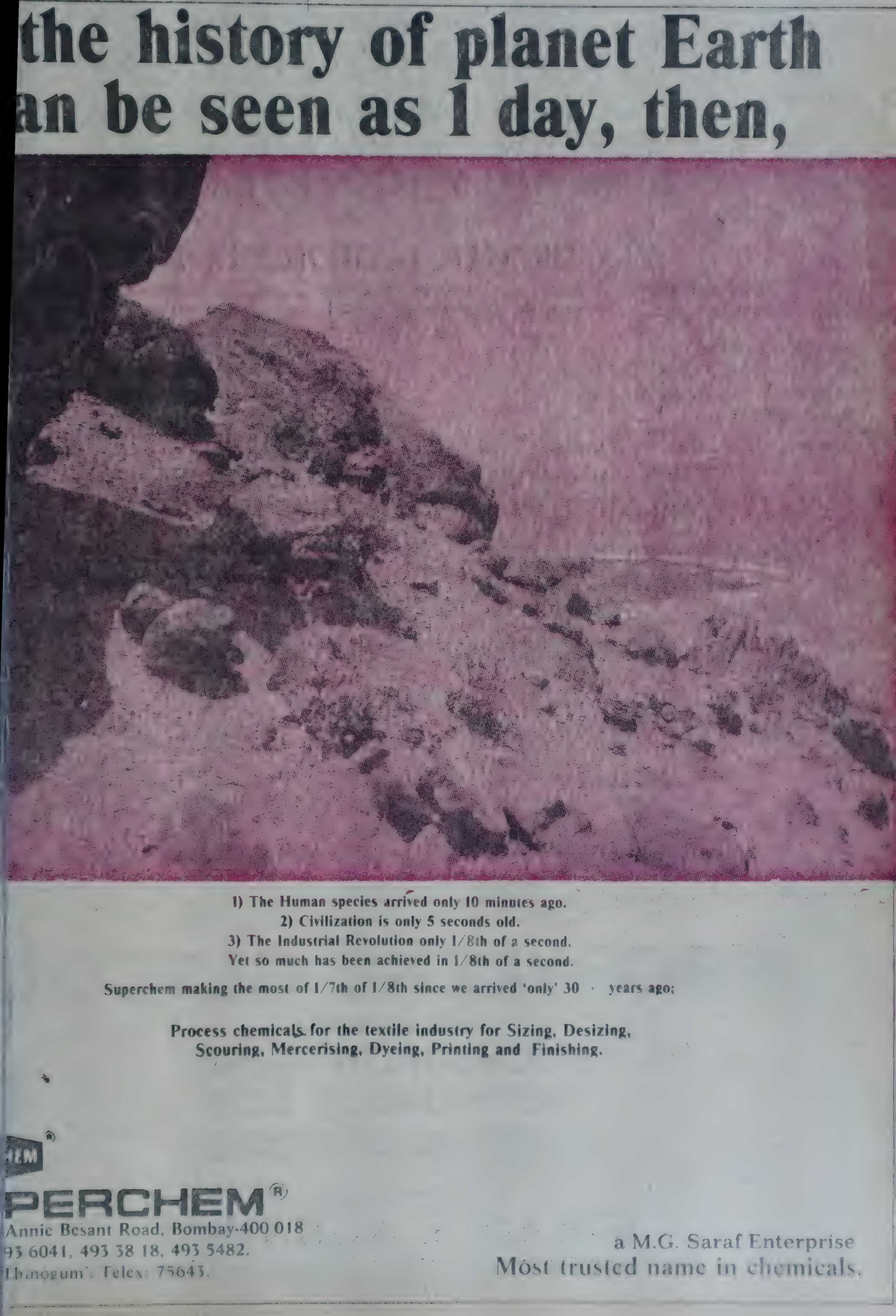

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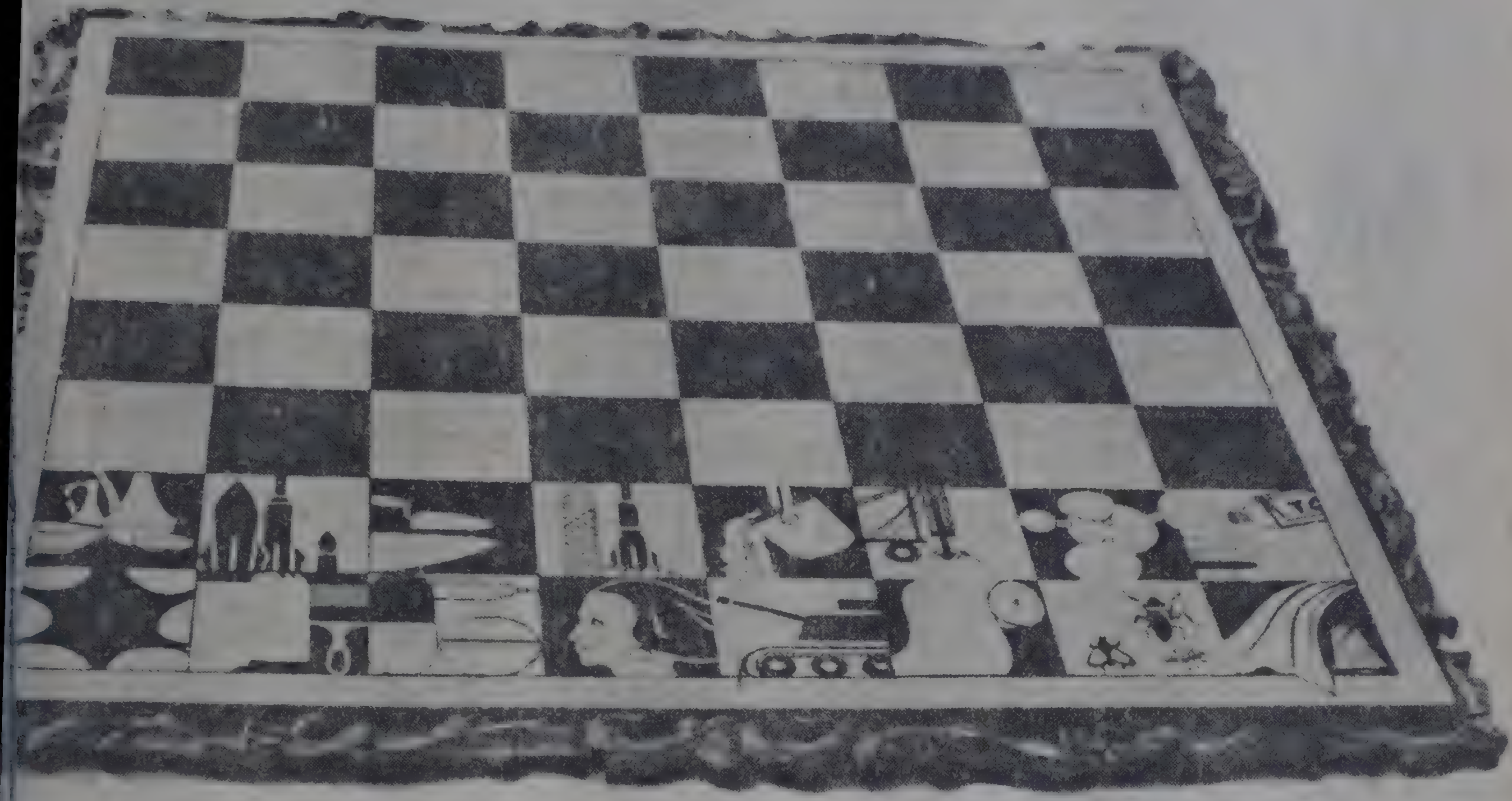

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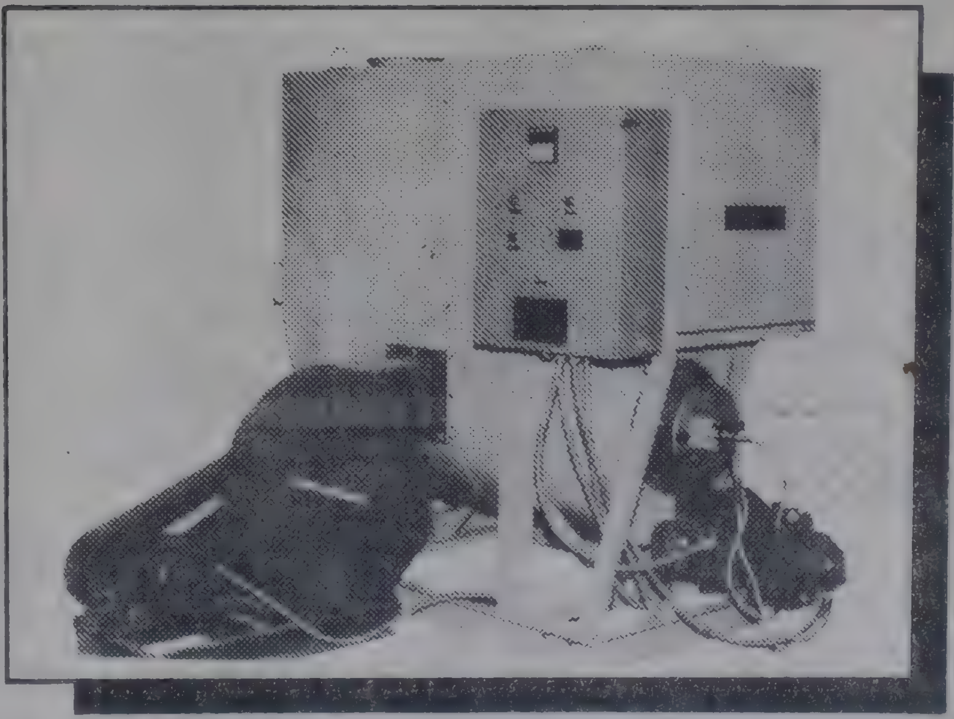

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CHEMICAL
WEEKLY

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HERALDING THE 21st CENTURY - 36

e Commercialisation of Space

for leadership status as a space
y, as a nation it realizes that mili-
ndeavours have a symbiotic rela-
ommercial space endeavour, the
it to support economically, and
ajor military space presence. In
litary will be essential to protect
he future space commerce.

he world will most likely see:
orbit that will absorb solar energy
where it will be converted to elec-
e moon and asteroids, which will
materials for the construction of
ents, and from which earth will
precious minerals and raw mater-
of automated factories and scien-
nd the first colonies on the moon
orbit. Those who control these
the close of the 21st century will
onomic influences on earth.

Makers: Today, communications
er for non-military applications in
-generating activities in space in
ill be derived from transportation
facturing and remote sensing.

ort services currently involve the
hich has already resulted in stiff
organisations, including those of
opean Space Agency (ESA), the
several emerging private enter-
nd Third World national efforts
also yield significant business in
servicing of satellites, the retrie-
efurbishment and the transport of
nto different orbits.

ace provides an optimal environ
quantities of certain materials and
[illegible]

undertaken without hindrance of traditional management and labour inefficiencies or parochialisms.

Imagery and other data derived from remote-sensing techniques will have impact on a wide range of earth-based activities. The exploration for terrestrial natural resources will primarily be derived from space-based sensors. The fight against acid rain, depletion of the ozone, the dwindling Amazon and other environmental concerns will be monitored from space. New weather satellites and enhanced processing techniques may add some credibility to weather forecasts.

Two relatively near term areas of commercial space endeavour that deserve special mention are the space processing of medicine and the commercialization of remote sensing.

Space Processing of Medicine: Down to earth concerns with health care can be dramatically aided by heavenly business ventures projected to occur over the next two decades. McDonnell Douglas and Johnson & Johnson have initiated a joint effort to produce a single space drug, which is estimated to generate over $1 billion in annual sales by the mid-to-late-1990s. Plans are for near-term development of a large commercial pharmaceutical factory spacecraft that would eventually become part of space station Freedom. McDonnell Douglas is exploring processing additional drugs with other pharmaceutical companies and expects to be producing ten different celestial medicines by the turn of the century.

Mass quantities of hormones can be produced in space from the electrophoresis separation process. This is where biological matter is removed from it's surrounding medium by passing a fluid between walls that are emitting an electric charge. On earth, the convection forces caused by gravity limit cell movements, hindering the separation. In prior experiments on earlier shuttle flights, a four-to five-fold increase in medicine purity has been demonstrated by space processing.

McDonnell Douglas has also been pursuing other space-based medicine ventures. It has teamed with Washington University in St. Louis, MO to research a space pancreatic cell separation in order to find a possible cure for diabetes. In joint discussions with the [illegible] Medical Foundation, the [illegible] research involves the production of monoclonal antibodies in space. The monoclonal process involves fusing harmful cancer cells with antibodies, producing cells that fight the disease.

Remote Sensing: Remote sensing technology for detecting new yields of rare metals, fossil fuels and other scarce natural resources is just coming of age. For two decades the United States has led the world in land-sensing commercial applications. France, the Soviet Union and Japan are offering competition in this area.

The French and Japanese governments pay most of the cost of orbiting their remote-sensing satellites, allowing commercial ventures to reap the profits of gathering and processing the imagery, without paying the hundred of millions of dollars in satellite costs. Only the United States is trying to commercialize both ground processing and space operations. In order to achieve competitive success in the long term, the U.S. government will remain an active supporter of remote sensing.

The Soviet Aerospace Programme: The Soviets are by far the strongest challengers to the US. Their recent successful precision launch and recovery of an unmanned space shuttle (which appears to be a carbon copy of the U.S. shuttle design), bespeaks their grasp of this technology. They hold a clear lead in access to space with dependable launch vehicles, and in manned flight. They have the only operating space station, the most comprehensive remote-sensing system, the best quality commercial high-resolution satellite photos for sale, and have begun to market satellite communication services for half the price of the West's INTELSAT. The largest rocket being developed today is the Soviet Energiya.

The ESA, largely dominated by France but consisting of 12 other European members, has become a significant space player. It has developed its own launchers (the Ariane family of rockets), as well as a spacelab manned laboratory module for use on the U.S. shuttle. Its other programs include the Columbus manned module for the international space station, a free-flying orbital experiment platform and the minishuttle/spaceplane, Hermes. West Germany has become the world's leader in microgravity research an essential ingredient in space manufacturing. Italy's domestic satellite, Italsat, incorporates technology rivaling NASA's Advanced Communications Technology Satellite.

China has created a space infrastructure centered on its dependable Long March series of rockets. It has launched over 20 satellites and, besides the superpowers, is the only nation capable of recovering payloads from space. It has plans for a more ambitious program, including manned flights. Japan, the economic superpower, will by 1992 fly its own-built H-2 launcher, comparable to the Ariane 4 and the Atlas-Centaur. Japan's commercial communications satellites are more advanced than those developed in the United States and Europe, and it is pioneering new technologies for remote sensing. Japan is vying with Germany for leadership in microgravity research, and has begun its own space shuttle effort named Hope.

Mining Space's Riches: As the lure of rare spices sent Europeans across vast oceans to new lands, so may the yield of extraterrestrial minerals serve as a catalyst for space voyagers. Projections for the 2020 time frame portray a with increasingly intense competition for scarce resources. The Apollo missions revealed that the lun contains many common, but useful, elements. These aluminium, silicon, oxygen, titanium, iron and calcium but still useful, amounts of boron, gallium, potassium phorous and rare earth elements have also been found vier metals than iron are rare but may be found in a meteor strikes. Most of the lunar ores can be strip m Lunar ores can also be used for the production of glass erglass, ceramics, semi-conductors, metal sheets and honey-comb metal sheets and composite materials su boron-fiber reinforced ceramics.

Lunar materials should be the foundation for moon construction. Each pound of material that can be pro locally on the moon means saving a pound of material would have to be imported from earth. Not only would materials benefit moon construction, but they also wou economical for building low earth orbiting stations and processing orbiting space factories. With only one-sixth gravity of earth, lifting off materials from the surface moon would require much less energy than from ear pound of material costs $1,000 to launch from earth, as pared with only 10 cents when launched from the m

Between the orbits of Earth and Mars lies the asteroid where the 21st century Gold Rush will take place. A nomers estimate that many of the 500,000 asteroids including those less than one-tenth of a mile in diameter yield rich veins of valuable ores. The extraction process be relatively simple and could be performed remotely robots. The minimal gravity would make transportation very reasonable. Planetary scientists believe that aste contain high yields of cobalt, platinum, silver, gold number of materials considered to be strategically val making the future world economy dependent on the ac of space miners.

The United States Congress has often emphasised maintaining the leadership in space is essential for the m nance of the nation's economic and military competitive

Our vision for space should not simply be a pla destruction, but rather for building up of global eco infrastructure. The United States must be the leader based advanced materials, chemical and medicine produ

The space station is not an end in itself; rather, it be a tool to create new industry for the world.

Exploration of the solar system should be treated tinuous, ongoing program. Progress may be in times, but it should never be put on hold. lead regressed space program that we have today. A effort must be aimed at exploring mining and moon, Mars and the asteroids over the next centu a manned mission to Mars, preferably as a joint vour, should be taken, in part as a measure to enh and understanding. If this is not possible, then trip to Mars should be a venture of the United S allies, to be achieved near the turn of the centu

-- T.P.

(Condensed from an article by Dr. E.D. Copp M. Shaker in *Defence & Diplomacy*, (August

EMARENA

KITESWARAN

Dam projects and their impact

wo items of recent news and announcements great impact on our development strategy for ad. This is on the controversies over the two m projects—Tehri Dam in the Himalayas and Sagar in Madhya Pradesh-Gujarat, both started f uncertainty.

is reportedly in a quake prone area and expected vast tracts of forest land. Expected to cost over s it is primarily for electric power generation ntry badly starved of electricity and increasingly e coal, oil/gas and nuclear sources with equally ct on the environment. Tehri Dam seems to have by a World Bank Team which came to the con- it was not a viable one on investment/returns resent focus on Tehri Dam is due to the frontal e well known Sri Sunderlal Bahuguna who orig- hipko movement for preventing the destruction est land. He was on fast to death at the dam site Government of India agreed to halt the work and he environmental aspects. But counter protests ed in the decision of the UP Government go on rk and Mr. Bahuguna's fast has been resumed. ssible even at this stage to take a fresh look at ject of this nature and see if modifications are at and to reassure the public mind?

mada Sagar, the nucleus of the Narmada Project eper troubles. The Narmada Sagar is not only to ast tracts of prime forest land but displace thou- ople who depend for their very existence on these their produce and have thus lived on for centur- st of rehabilitation of thousands is enormous but so is whether such adivasi folk would survive in nt conditions. The World Bank has sanctioned of this dam and seems to have assured itself that res for rehabilitation are satisfactory. It is a power tion project with far more emphasis and returns ation benefits apart from flood control. The total Narmada Valley project is to run into Rs.10,000 r a period of 15 years. The benefits are largely for tream state of Gujarat while all the environmental d displacement of people is in Madhya Pradesh. previous Chief Ministers of M.P. were adamant ahead, a new chief has in his first public statement the project as "criminal, mindless and unfit for execution". There was a massive demonstration recently in the town of Hirsud (of a few thousand population) which is to be obliterated by the water. The entire population is to be settled elsewhere but many are not interested and have raised banners of revolt. The new Minister for Environment of Govt. of India was at the massive demonstration. Forest land is too precious a heritage and has far more benefits than as a provider of fuel (which can be from alternate sources). "Social forestry", is no substitute for prime forest lands but only a provider of fuel wood. Decrease in height of the dam can certainly save thousands of hectares of forests and crores of rupees in rehabilitation of displaced people. For Gujarat the Narmada Sagar has become a political issue though the location is in the upper riparian state of Madhya Pradesh.

Is there no reasonable compromise which could be worked out even at this stage?

In this context it is useful to recall the fate of the "Silent Valley" project for electric power generation in Kerala. This economic and viable project was the subject of extensive controversy over the prime biosphere area which would be submerged (not any extensive forest land) or destroyed by the human activities in this otherwise impenetrable area. It was the view that the only tropical area with high rainfall and serving as a natural source of evolution of plant species will be lost. The arguments that much of this area could be left intact by limited and restricted access to the project site were turned down and the Silent Valley remains a mute witness of the untapped potential for cheap hydro power. Perhaps Kerala State does not have the same clout as U.P. or Gujarat. Even the premises on which the project was shelved have not been studied in detail to justify the possible disruption of the bio evolution.

The same Madhya Pradesh Chief Minsiter who condemns Narmada Sagar is anxious to go ahead with Bodhghat Project in the same state but in a Western Adivasi area although such a project was severely criticised by experts and the environmentalists because it would disrupt the life styles (even though primitive) of many thousands of Adivasis and even the World Bank raised objections. Apparently there are no clear yardsticks to assess the impacts of these multipurpose mega projects associated with serious disruption of life of lakhs of people and on the environment. Even experts of the World Bank have varying standards.

Moving away from India there will apparently be an inevitable holocaust in Brazil if the present practice of burning and destroying rain forests to ashes to enable cultivation and settlement of lakhs of people persists. It is reported that 12350 square miles have been ashed and the pace of destruction is increasing every year. The thick forest cover of the upper Amazon basin extending to 2.7 million square miles is said to be the world's greatest pharmaceutical laboratory with its rich and varied plant species. Our Silent Valley is nothing in comparison. The worst scenario is of climatic chaos when the 170 billion gallons of rain water per hour could not be held back by the vegetation and go hurtling down into the river. Even the cleared areas are not properly cultivated and get reduced to yield poor crops and the settlers seek new pastures to burn. The industrialists on their part cut down to make charcoal by wasteful burning for supply to b naces to make iron. The evolving tragedy in the Am valley is a matter of global concern and environmen are anxious that the destruction is halted before it be irreversible. There is no power generation or irrigation t tify such action. It is understood that Brazil is being of progressive write off of a part of their immense debt $110 billions) as an incentive to stop this wanton destr tion of prime forest land.

India's aggression on her environment and problem eking a livelihood from forests and trees is much milder Brazil but high time for some rethinking.

Haldia Petrochemicals and the new suitors

As mentioned earlier the green signal and foundation stone for Haldia Petrochemicals has led to keen interest of the top private sector parties for partnership. This is a happy augury but basic changes in concept and uncertain financing patterns should not lead to further delay and cost escalations. We again find a reversion to the earlier concept of "mother" cracker and downstream projects with different ownership. The NOCIL project had tie ups with two different partners —one of these only for HDPE - but the Indian party was the same. IPCL discarded this approach of "umbrella" concept and opted for a single public sector company for the total complex. It is also proceeding in the same way for the second gas cracker complex and is set to adopt the same policy for the third complex at Gandhar which has been assigned to it. Reliance was also allowed to take over all the downstream products of the Gujarat Gas Cracker and earlier approvals of some of these to other parties were withdrawn — on the same parallel of NOCIL and IPCL being under one ownership.

It is reported that W.B. Government will be the partner of the total complex and while the Goenka group will continue to be its partner for the cracker and one or two downstream plants, another partner will be chosen for other downstream projects. This exercise must not be prolonged nor delay the work on the cracker to be taken up.

It is intriguing to find some comment that we should stick to gas crackers and not turn to naphtha. But apparently this concept seems to be directed at Haldia which it is suggested should be shelved. If we should stick to gas cracking there was no justification for the NOCIL "expansion" or for the approval of other two projects proposed at Vizakhapat and Madras. Gas cracking has no doubt the highest prior for the ethane/propane feedstock is otherwise wasted or flar away; this is also the reason for higher priorities for Gan har, Jagdishpur and Auriya. We have the tendency to clot arguments favouring one particular programme as again another in pseudotechnical attire. If petrochemicals a "unwanted" it applies to all projects and not to a speci ones such as Haldia. There is apparently too much consi erations of aspects other than technical or feedstock base advance specific projects — a tendency which is all t common when projects are decided on extraneous consi erations and ruled out as happened to Haldia for over decade.

The NOCIL project has also come under attack again fro the environmental groups and the Minister concerned h called for a review of the approval already granted. The has been a well argued defence of the location in Trans Tha Creek and that pollution levels will not rise with the fo fold expansion as adequate measures will be included. Th NOCIL argument is also that the project is well covered f its foreign exchange needs without any drought on the cou try's balance of payments for servicing of debts. But ques tion of raising overseas equity to 40% or more in the proj so as to cover the foreign exchange requirements is a ba question, which requires prior decision.

We seem to be still unclear on our objectives and im iate targets on petrochemicals.

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BPCL's extraction plant commissioned

A Rs. 16.5-crore plant constructed by Bharat Petroleum Corporation Ltd. (BPCL) for extraction of hexane from the Bombay High crude using the pollution-free sulpholene process has been commissioned.

Announcing this at a press conference at Bombay recently, Mr. K.R.S. Narayan, BPCL's director (refineries), said that the plant has an annual capacity to produce 25,000 tonnes of hexane, which is enough to cater to about 40 per cent of the country's soaring demand for hexane required by the solvent extraction units. BPCL has already begun working on a plan to double this capacity. The only other producer of hexane in India is Hindustan Petroleum.

BPCL has also commissioned another Rs. 23-crore plant to produce 50,000 tonnes of propylene every year for supply to the Maharashtra Gas Cracker Complex at Nagothane through a pipeline which is under construction. As against the targetted parameter of 55 per cent purity, BPCL has been able to achieve 75 per cent purity in its propylene product. BPCL has also entered into an agreement to supply about 30,000 tonnes of naphtha to Reliance at Patalganga, according to him.

Another recent achievement of this public sector giant is the commissioning of a 25 mw co-generation plant using the GE technology. The project was implemented by another public sector giant, BHEL. This plant would be able to take care of the BPCL refinery's full power requirement which is about 18 mw. BPCL has a plan to set up another 25 mw co-generation plant and to supply power to the state power grid at a competitive rate. (It costs only 55 paise per unit to cogenerate power, according to a BPCL spokesman).

Mr. Narayan announced that BPCL has been able to reduce air pollution by the refinery in a big way by adopting advanced pollution control measures. It has also set up a sophisticated air pollution monitoring unit. Among BPCL's projects in the pipeline are: Rs. 35-crore project for maximisation of benzene extraction at its aromatic plant (to be completed in 24 months); Rs. 35-crore project to modify the cat cracker debottling unit (15 months) and a Rs. 16-crore project to reduce biological oxygen demand to the minimum international standard (Minas) (to be completed in two months).

BPCL is expecting clearance of its Rs. 120-crore project for extracting N-paraffins from kerosene by the Public Investment Board soon. The project is to be implemented within 30 months. It has already obtained environment clearance for its Rs. 375-crore project to be located in Bombay. Similarly it is also hoping that its Rs. 2,600 crore Central India Refinery (to be located near Bhopal) will be cleared by PIB.

IPCL'S XYLENE CAPACITY TO BE RECOMMISSIONED

The production of ortho-xylene will be increased from 21,000 metric tonnes per annum (MT para-xylene production would from 17,000 to 32,600 MTA recommissioning of the India chemicals Limited (IPCL) xyle The revamping and expansio plant has been done at a cost crores. Production of xyelne suspended for the book up since August last year accordin Indian Petrochemical Corporatio ited press release.

The production at the capacities is however expected by March this year and will help the foreign exchange spent on ing xylene. IPCL will consume 2,000 tonnes of para-xylene for tive use and the balance will be able for sale, the release added.

The revamped xylene plant will available quantities of solvent for the pesticides sector, paint ind and the speciality chemical field revamping process is highly saving because of heat integra use of high yielding indigenous lysts.

Tatas to set up Haldia project: RPG m get downstream units

The Haldia petrochemical project will be set up jointly with Tata Tea Ltd., the West Bengal Chief Minister, Mr. Jyoti Basu, announced in the State Assembly on January 24. Making a statement, he said the State Government had assessed 10 proposals and decided to have a joint sector company with Tata Tea.

He said 26% of the equity would be held by the West Bengal Industrial Development Corporation, 25% by Tata Tea and its associates. The remaining 49% would be held by public and financial institutions.

Mr. Basu said the joint sector company with Tata Tea would set up tha cracker plant and the major stream products such as HDPE HDPE/LLDPE, styrene, polysty butene-1, butadiene and acety black.

He said the State Governmen considering the possibility of another joint sector company Mr. R.P. Goenka, the origina in the joint sector, to set up downstream units using styre adiene and C4-raffinate. The ity of setting up further units joint sector company on the ethylene and propylene was considered, he said.

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H.L. ROY — 'HIRA' OF A MAN

HLR, a 'gem' of a man, what an apt name - Hira Lal Roy. I knew HLF rather well and closely during my years in Calcutta, 1957-1963. With another doyen, Dr. G.S. Kasbekar, I was intimately involved in the Institute's affairs and used to meet HLR often for advice, to hear words of wisdom and otherwise just to relax. This is the period when Kasbekar and I set ourselves and met the challenging target of doubling the Institute's membership from some 500 to 1000 in a couple of years, thanks to HLR's guidance. On the occasion of HLR's birth centenary, I would like to share one very personal and as far as I know hitherto unreported thought of this great man. More than a thought, it was a 'fear' — expressed to me repeatedly, specially during April 1963, when I was waiting to shift to Bombay, and was temporarily staying at Jodhpur Park, very close to HLR's home. I used to just walk over to his place for inspiration and just to be with him.

In regard to the Institute's affairs and management, HLR was most unhappy that the Institute and those closely connected with its affairs were rather 'parochial'. This word he had used so often, not once but many a time at each of our meetings, that it is the first word that comes to my mind whenever I think of this great man. Later events proved him absolutely right. Let me relate just two incidents. FIRST one occurred at the Institute's annual meeting at Durgapur in the last week of December 1965. Thanks to the initiative of Dr. G.P. Kane and other senior members, I used to host an informal get-together on the eve of the first meeting of the new Council. Just a social affair to arrive at a consensus for the next year's office bearers. Talk was free and frank and the consensus was always carried by the new Council, i.e., always except at Durgapur. At the last minute a surprise was sprung by the Jadavpur group, in the form of coopting of the senior members to the Council and in the same bre proposing his name as President. We were all taken ab but I must say that, as always, Dr. G.P. Kane was very qu in 'reading' the situation — before I could even fathom to what was going on. It was a 'tamasha', and I can't fi any better or more appropriate word for it. The very peop who were party to the consensus conveniently forgot wh they had agreed to the night before. Thanks again to D Kane's foresight, a crisis was averted and a formal vote wa avoided. But the whole affair left a bad taste, and perhap ended a healthy tradition — all because of parochialism th HLR had warned me about. On occasions such as this, am left wondering whether there is any such thing as hu conscience, and whether it pricks one when the person w completely betrays his own agreement and deliberately.

SECOND incident happened in New Delhi just a fe months ago, when I called on a very senior member of the Ins titute, one very close to HLR — in fact living in the sam home, or next door. Just a courtesy social call and in th course of our visit he mentioned that he was working on commemorative volume to be brought out on the occasion o HLR's birth centennary. He was disappointed at the poor res ponse to his request by a large number of persons who h thought knew HLR personally and well. Of course, I was n on his mailing list, but he did have the courtesy to ask me fo a contribution. I agreed reluctantly but expressed my reserva tions that he may not like what I might send. To refresh hi memory, I even recalled the Durgapur incident with its paro chial 'wheeling and dealing', for he himself was a party to i

I often wonder whether HLR would have approved of o even be a party to having the Institute's permanent he quarters at Jadavpur. New Delhi is a far better and nea place for this, although Jadavpur justifiably can claim it was the birthplace of the Institute. Going by member Bombay is the logical choice. But all this is now history though it is refreshing to recall it, in memory of the gr Hira Lal Roy.

Dr. Kharbanda, a Fellow of the Institution of Chemical Engineers, is a visiting professor and an author of repute. His recent title: CAPITAL COST ESTIMATING FOR THE PROCESS INDUSTRIES, (Butterworth, 1988). Forthcoming titles: (All with Mr. E.A. Stallworthy) WASTE MANAGEMENT — TOWARDS A SUSTAINABLE SOCIETY (Gower, 1989) & PROJECT TEAMS — THE HUMAN ELEMENT (NTL. COMPUTING CENTRE, 1990). Available from Vivek Enterprises, 5, S.K. Barodawalla Marg, Bombay 400 026.

n endless wait for MGCC

ıtra Gas Cracker Com-
f Indian Petrochemicals
d. (IPCL) is dressed up
o go. Its commissioning
ned indefinitely because
part of Oil and Natural
on in providing C2, C3
racker was originally to
tream in December. The
he Rs. 1,900-crore pro-
ve been 4.5 lakh tonnes
ane/propane from a gas
plant to be set up by
an says a report in the
press.

Vahi, ONGC's former
never tired of saying that
flared because there were
ironical that delay on the
is standing in the way of
g of India's first gas cra-
ch would have produced
ort-substitution products.

ent supplies from ONGC,
leum Corporation Ltd.
o supply 51,000 tonnes of
ylene a year from its
y in Bombay. While no
hen ONGC's facility will
BPCL's facility to supply
f propylene every day to
en ready for commission-
arch 1989, but has been
PCL has invested about
in the project. The pipe-
rt propylene to Nagothane
been completed.

CL appears to have fore-
on the part of ONGC and
he idea of cracking LPG
to commissioning the
me. This was not imple-
ably because LPG is a sen-
t, a consumer item for
untry is heavily dependent
t is noteworthy that for its
racker based on Gandhar
ill be taking the gas from
setting up its own fractio-
erhaps to avoid the MGCC experience. MGCC has a capacity to produce three lakh tonnes of ethylene, which is to be upgraded to four lakh tonnes in due course. This expansion is, however, subject to a review being conducted by the Petroleum Ministry. The following is the product-mix based on three lakh tonnes of ethylene. LDPE 80,000 tonnes, LLDPE/HDPE 1.35 lakh tonnes, ethylene oxide 10,000 tonnes, ethylene glycol 50,000 tonnes, polypropylene 60,000 tonnes, acetylene black 1,740 tonnes, butane 1-15,000 tonnes, and wire and cable compounds 25,000 tonnes.

TELK GENERATOR FOR NPC

A 260-mva 220 kv generator transformer for the Nuclear Power Corporation (NPC) for installation in their Tarapur Atomic Power Station, manufactured by the State public sector Transformers and Electricals Kerala Ltd. (TELK) at Angamali, 40km from Cochin, was handed over to the Atomic Energy Commission Chairman, Mr. M.R. Sreenivasan, at the TELK premises on January 22. Manufactured at a cost of Rs. 2.54 crores, the 180-tonne generator, the largest size being used in India, is to be transported to Tarapur by a special wagon owned by TELK. TELK had earlier supplied similar generator transformers for atomic power stations at Narora in Uttar Pradesh and Kalpakkam in Tamil Nadu. It has also supplied similar large transformers for the Kakrapar atomic power project in Gujarat.

TELK is one of the leading manufacturers of extra high voltage power transformers in the country and has been supplying power equipment to all the State electricity boards, the National Thermal Power Corporation, National Hydro Power Corporation, the Tata Electric Company and other power supply undertakings and railways.

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Inadequate growth in fertiliser output

The output of nitrogenous and complex fertilisers will have to be doubled atleast in the Eighth Plan to 12.5 million tonnes and 4.5 million tonnes of phosphatic fertilisers if an increase in imports has to be avoided. With a big step up in the output of urea and other nitrogenous fertilisers, near self-sufficiency was achieved in 1987-89. The favourable trends in production in 1988-89 were due to the commissioning of five large gas-based fertiliser projects. All these units are functioning efficiently and utilising the capacity fully.

In fact, it was necessary to regulate production in 1987-88 when there was a meagre growth in offtake on account of drought conditions. Following the Thal Vaishat and Hazira mammoth units, three new units having a capability of 1,350 tonnes of ammonia and 2,200 tonnes of urea daily have been commissioned in Bijaipur in Madhya Pradesh, Aonla and Jagdishpur in Uttar Pradesh. But the momentum has not been sustained as the remaining projects of Zuari Agro Industries, Tata Chemicals and Bindal Agro will be taking shape only in 1992-93.

Another unit in Andhra Pradesh may also be arriving on the scene at about the same time. But the demand for nutrients will be rising if the growth in agricultural production is maintained at three to four per cent annually.

Need for doubling capacity in Eighth Plan

As the new Government is keen on strengthening the agricultural sector and boosting production of food and cash crops, it has to be ensured that the output of different types of nutrients is increased steadily for the execution and expansion of new schemes. Though there are differing estimates about the demand for nutrients in 1990-95, it is clear from the assessment of various agencies that there will be bigger gap in availability of all types of nutrients by the end of the next Plan.

The progress in the Seventh Plan will be truly impressive as it is estimated that the capacity for nitrogen will be rising to 9.3 million tonnes from 5.6 million tonnes and for phosphatic fertilisers to 2.7 million tonnes from 1.6 million tonnes in 1984-85. The output also will be increasing to 6.6 million tonnes from 3.9 million tonnes of nitrogen and that of P_2O_5 to 2.2 million tonnes from 1.33 million tonnes in 1984-85. This rate of growth is unlikely to be sustained in 1990-95, as no new plants for additional capacity in nitrogen are envisaged. However, there is a controversy whether it will be desirable to produce complex fertilisers within the country with the dependence on imports of rock phosphate, sulphur and phosphoric acid and it will not be cheaper to import diammonium phosphate and other complex fertilisers.

As sample gas reserves are available and there will also be a surplus of naphtha in different regions, new gas based fertiliser plants will have to be located in dispersed regions with the creation of a national gas grid. As there may be delay in commissioning entirely new fertiliser units, other than the three plants under construction, the expansion schemes of the existing efficient fertiliser producers should be implemented as the outlay will be smaller than on entirely new units. Also, the schemes can be completed in 18-24 months. The proposals of EID Parry, Madras Fertilisers, SPIC and others are still under the consideration of the Government.

Pragmatic pricing policy essential

In view of the need to prevent an avoidable increase in imports in the coming years, quick decisions will have to be taken about the execution of new and expansion schemes under different auspices. The policy relating to pricing of fertilisers also has to be pragmatically conceived as the profitability of working of Indo Gulf Fertilisers, Gujarat Narmada Valley Company and others has not been satisfactory under the revised retention price formula Central Government is, of course ried about an increase in expenditu subsidy. It may not be inclined t prices for nutrients at the retai when it is being emphasised tha farmers should be given a better and provided supplies of input affordable prices. While it remains seen how the conflict in interest wi resolved, it will be readily agreed the fertiliser industry can effect ad tions to its capacity at the desired in the coming years only if investment is worthwhile.

-- The Hind

BOOM IN EXPORTS OF POLYESTER STAPLE FIBRE

There is virtually a boom in exports of polyester staple fibre from country in terms of quantity and val The exports have doubled in terms quantity during the first eight months the current year (April-November 198 at 25,918 tonnes when compared wi the volume of 12,988 tonnes during corresponding period of 1988-89.

They have recorded an unprecedent growth of 215 per cent in terms of val during the same period, making the unit realisation at much higher level PSF exports have gone up to Rs. 65 crores during the first eight months 1989-90 from that of Rs. 20.71 cror during the corresponding period la year. This has resulted in the per kg re isation going up substantially Rs. 25.18 during the current year fro the level of Rs. 15.94 last year increase in per kg realisation by cent over a year is tempting even af allowing for around 13 per cent ciation of rupee during the period, ticularly when the local market attractive. The upward revision exports in terms of quantity, valu per unit realisation appears to gathered momentum during the las months if the trend in November (the figures for which are avail present) are any indication.

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CHEMICALS INDUSTRY

Soviet help in technology transfer welcomed

The Petroleum and Chemicals Minister, Mr. M.S. Gurupadaswamy welcomed Soviet help in terms of straight technology transfer or joint ventures on mutually acceptable terms to give a boost to the chemicals industry in India. Inaugurating a seminar on chemicals and pesticides and industries of India and USSR under the auspices of the Indo-USSR Chamber of Commerce and Industry, Mr. Gurupadaswamy said his ministry had prepared a perspective plan for the development of chemical industry in India.

Since Soviet Union had also prepared a plan for development of chemical industry in the USSR by 2000 AD, mutual exchange of views on the subject would be beneficial, he said. The minister said India and Soviet Union could also identify specific projects where joint ventures could be set up in the Soviet Union and in India and possibly in third countries in the field of pesticides and chemicals.

Mr. Gurupadaswamy said, "we do recognise that in spite of rapid developments and improvements in technology of various chemicals in India there are still areas where we either need fresh technology or upgradation". The minister also said the chemical industry the world over was seen as a potential threat to environmental conservation. "While some of the fears on this account may be exaggerated we have to be conscious of our commitment to maintaining an environment free from pollution and fit for the human race".

Experts in both the Soviet Union and India could consider methods for ensuring safety in the manufacture of chemical products particularly pesticides, he said. "We have to search for methods which are effective in controlling hazards and pollution and are at the same time not very costly", he said. His ministry, while committed to catalysing chemical industry growth, was also equally committed to controlling hazards and pollution, he added.

Mr. Gurupadaswamy said in 1988-89 exports from India to the USSR covering chemicals, drugs and allied products exceeded Rs. 3,000 million which was a significant proportion of the total trade between the two countries which had now grown to more than Rs. 70,000 million. Exports of chemicals and pharmaceuticals crossed Rs. 20,000 million last year, he said, hoping exports of chemicals, agrochemicals and pharmaceuticals would increase further. Earlier, the visiting Soviet Deputy Minister
for Chemicals, Dr. A.S. Che
co-operation between India
Soviet Union had now to di
sectors like chemicals and ph
icals. Hitherto it had been co
heavy engineering and steel in
said.

Chemicals secretary, Mr. M
said detailed plans for major se
chemical industry had been dra
part of the perspective plan fo
ical industries in India.

P.K. IYENGAR APPOINTE CHAIRMAN

Dr. P.K. Iyengar, Director of
Atomic Research Centre (BA
be the new Chairman of the
Energy Comission and Secreta
Department of Atomic Ener
Iyengar will succeed Dr. M.R
asan, who retires on January
official spokesman said Dr. Iyen
have a three-year tenure. Dr. Iye
at present the Chairman of the
tional Radiation Physics Soci
several other professional so
Born in 1931, he did his M.S
Travancore University and Ph.D
Bombay University. He has spen
working years with the Depar
Atomic Energy. He took over as
tor of BARC in March, 1984.
sonal specialisation has been in
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an-licence scheme to continue

e for the manufacture of is will be permitted till ctice will continue even in specific cases linked d other qualifications, Mr. Shyam Suri. This following ernment's acceptance of ions by Dr. Premkumar rug Controller, who had ed to study the issue, d. Addressing the annual ting of the Indian Drug rs Association in Bombay 20, 1990, he said a notifi regard is to be issued soon.

vas responding to remarks Gandhi, President of Indian facturers Association. The vernment had announced its abolish the loan-licence March 1990, as part of the for rationalisation, quality control and growth of drugs and pharmaceutical industry." The decision had come as a bolt from the blue to cover 8000 loan licence units, 85% of which were in the hands of self-employed technocrats and marketing professionals.

Defending the practice, the industry had submitted that the system had played a vital role in the development and growth of the industry for more than 40 years. The system is in vogue in developed countries like the US, Japan, the UK and West Germany. Indeed, a good number of large pharmaceutical companies today began as loan-licence units. What was undesirable and the Government wanted to eliminate was the existence of units which do not manufacture anything of their own, but flourish on cent per cent contract manufacture and plan to continue as such. The industry at large agrees that such units ought not to be encouraged. However, it contends, that a large tableting unit embarking on a small diversification into capsules should be allowed to go for contract manufacture, until the new activity grows large enough to justify the setting up of its own capsulation facility. Similarly, large, unexpected export orders like those from the Soviet Union cannot be executed in one's own plant.The Government now seems to have accepted this argument. IDMA claims that loan-licence manufacturers provide direct and indirect employment to about three lakh people, including ancillary industries. The turnover of these units together is over Rs. 400 crores. The decision to abolish the system had resulted in an avalanche of protest, forcing the Government to set up a committee headed by the Drugs Controller to examine the various objections raised by the industry. The committee had unanimously recommened extension of the system for four years from 1990.

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Standing panel on drug prices being set up

A high-level standing committee on drug prices is being set up by the Government which will go into all policy and practical questions on drug pricing.

The committee is to be headed by the Secretary, Department of Chemicals and Petrochemicals. Members will include Additional Secretaries of other related departments like Health, Biotechnology and the Bureau of Industrial Costs and Prices. It will also take decisions based on the recommendations of the supplementary report on category two reports prepared by Dr. Vijay Kelkar.

To assist the standing committee, three working groups are being created at the lower level to conduct hearings with industry and associations and collect data.

The first working group will deal with therapeutic issues to deal with disease patterns and categorisation. The second group will take up research and development issues, indigenisation of technology, concessions for R and D expenditure and the like. The third group will study production issues, duty structure and their bearing on prices.

Talking to the members of Indian Drug Manufacturers Association (IDMA) at Bombay recently, Mr. Shyam Suri, Joint Secretary, Department of Chemicals and Petrochemicals, admitted to long delays in releasing price-revisions. The Government is attempting to rationalise the price fixing mechanism. BICP is working on a three-year escalation formula which should enable revision by simple calculation.

On self regulation by the industry, he said the current thinking is to permit the same once a year, but subject to the condition that the company should send
the cost data soon after impl

If the government found
increase was unjustified,
company be asked to pay up
Should the concept be appl
to formulations or should it
drugs? Should the exchange
be in-built into the system
questions require further stud
said.

Mr. Suri did not subsc
IDMA's contention that t
was spending two per cent
over on research and devel
felt it was one per cent or 1
at best. Now that the in
claiming two per cent, it sh
strive to achieve that level

The target of 1000 crore
pharmaceutical export by
1994-95 was very conser
industry ought to aim
observed.

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ntrol Board called for
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solved by a time-bound programme, he pointed out.

Referring to Mr. Hashim's call for experts from abroad, he said the Board would discuss it.

The three-month training programme will benefit 15 participants from the Caribbean countries and Tanzania in leather tanning and finishing and small leather goods manufacture. Carcass byproducts utilisation and physical testing of leather goods will also be taught.

LEATHER FAIR FROM JAN. 31

The fifth India International Leather Fair, organised by the Trade Fair Authority of India, will begin at Madras on January 31.

The five-day fair will be inaugurated by the Commerce Minister, Mr. Arun Nehru. He will also present the "best exporter" awards instituted by the Council for Leather Exports. The fair, which has export promotion and technology upgradation as its twin objectives has been growing in size and content, and within a few years of inception, it has established itself as an important event in the world calendar of leather fairs.

An additional significance of this year's fair is that it will provide a window-view of the shape of the world industry in store in the nineties and what it holds for India in the changing scenario in relation to its plans and projections.

So much so, the fair has been much awaited not only by prospective participants but also by buyers and other businessmen as evidenced by the heavy response. According to TFAI, the scale of participation and the composition of product display in this year's fair will be much higher and more varied than in the previous years.

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BHOPAL GAS LEAK VICTIMS

Prime Minister assures interim relief

The Prime Minister, Mr. V. P. Singh, announced that interim relief will be paid to the victims of the Bhopal gas tragedy in all the 36 affected wards in Bhopal. The Prime Minister said a high-level Central consultative committee with the finance minister as president, would decide within a month regarding payment of interim relief to the affected people.

The petroleum minister, the Union law minister, and the railway minister who would also be on the committee, would get in touch with voluntary organisations working for the relief of gas-victims and the Madhya Pradesh government, Mr. Singh said. Addressing a massive public meeting in Bhopal, the Prime Minister said the affected people needed quick relief and an interim relief would be paid first, overlooking medical reports. The Prime Minister said the gas-affected people had not yet been provided adequate relief though it was one of the worst industrial disasters that took place in Bhopal in December 1984 in which thousands had been killed.

He, however, assured the people they would not have to wait for long as the present government would provide them immediate succour. Amidst cheers from the people and slogans of "Union Carbide murdabad", the Prime Minister declared that the present government "will not bargain with the lives of those killed in the worst gas disaster in Bhopal. The present government will also not reach any settlement with the guilty Union Carbide on the lives of those killed in the disaster." "Such events", he said, "are national issues and should be taken up forgetting political affiliations." The Prime Minister

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PANEL ON REL VICTIMS

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Mr. Dinesh Goswa
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PIPING GAS FROM GODAVARI-KRISHNA BASIN

Efforts to set up distribution facility being explored

Discussions are on between industrialists in Andhra Pradesh and the concerned Central government undertakings on the possibilities of setting up a distribution facility for piping gas from the Godavari-Krishna basin and some onshore fields, Mr. Ajit C. Kapadia, managing director, Hindustan Oil Exploration Co. Ltd., (HOEC), said at Bangalore on January 23.

He said that a gas distribution plan was something which had to be undertaken simultaneously with the discovery of gas. However, in India, there was very often a long time-lag in this regard. For instance, gas had been discovered in South Bassein sometime in 1978 but it was only now that serious attention was being paid to the distribution aspect. HOEC, which was the first private sector company to be set up to supplement the efforts of ONGC and OIL in oil and gas exploration, was, he said, fully aware of the need to ensure that efforts for the distribution of gas went on simultaneously with its discovery.

"It is in this context that HOEC has made 19 per cent investment in the equity of the Gujarat Gas Co. Ltd. which is being jointly promoted by Mafatlal Fine and the Gujarat Industrial Investment Corporation (GIIC) to distribute natural gas in the state of Gujarat to industrial, commercial and domestic consumers", he said. Mr. Kapadia was in Bangalore in connection with HOEC's issue of one crore equity shares of Rs. 10 each for cash at par including an offer of 45 lakh shares of the Indian public to raise the equity base of the company which proposed to embark on three projects involving a capital outlay of Rs. 10 crores.

HOEC had signed a letter of intent with International Petroleum Ltd. (IPL) to take 10 per cent of the share in a Krishna-Godavari offshore block. The estimated cost for this project for drilling the first exploratory well was Rs. 4 crores. HOEC was also having ongoing negotiations with Oil India Ltd. (OIL) for joint exploration of areas in the Ganges basin.

The cost of integrating data and acquiring data in promising zones was estimated to work out to another Rs. 4 crores. The third project, involving setting up of infrastructural facilities like a computer centre for undertaking seismic data analysis, would cost about Rs. 2 crores. Mr. Kapadia noted that, while oil exploration was a high-risk area, it was also a
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Call to boost dyes, chemicals exports

Mr. Ramu S. Deora, Chairman Chemexcil, suggested that exporters of dyes and chemicals must endeavour to take up new export products and generate new markets to attain additionality exports.

Inaugurating a workshop jointly organised by Gujarat Industrial and Technical Consultancy Organisation (GITCO) and Gujarat Dyes Manufacturers Association (GDMA), he said that there were a number of factors which clearly indicated the bright export prospects for dyes and chemicals.

He pointed out that supply gaps in the international market compared to the total demand for dyes and dye intermediates and chemicals originate in many western companies.

This is because of the growing anti-pollution legislation enforced on these groups of items. The availability of a broad industrial base and technical capabilities in India, backed up by competent marketing force, and availability of spare capacities should be able to meet the growing export demand in the immediate future.

Although China has been generally thought to be a competitor for our products in the international market, there is considerable scope for exports of various items covered by the Council to China. Similarly, the importers of Europe seem to be quite receptive to Indian products, both in terms of quality and prices. Although they are, by and large, happy with delivery schedules, some improvments in this regard are called for.

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tests carried out, showed a power rating of 33 VAX million instructions per second (MIPS) at 40 megahertz making it one of the fastest of its kind in the world. Intel, he said, had designated Godrej as an authorised Beta site and handed over details of the microprocessor to the company by June 1989. Calling the occasion a historical event Mr. Agrawal said that with the new product Godrej would become a major force in the national workstation market. Godrej plans to market and licence the design on a worldwide basis, besides exporting the software developed for the product, which according to Mr. Parpia can be ported onto other work-stations also. The proposed price for the sytem at present, he said, was between Rs. 7 lakhs to Rs. 10 lakhs depending on the configuration. Future plans of the electronics division of the company, according to him, include the introduction of an Intel 860 multiprocessor by November 1990.

ICI PLANT GOES ON STREAM

ICI India Ltd., has started working its new 20,000 tonnes per annum polyester fibre plant at Thane. The company plans to work at 50 per cent capacity in the coming months and export 5,000 tonnes in 1990. It proposes to sell the rest in the local market in addition to the old 10,000 tonnes per annum plant. The company utilises PTA from Reliance Industries Ltd., at the exorbitant price of Rs. 32 per kg against the landed cost of Rs. 34 per kg. inclusive of 190 per cent import duty. Against exports of PSF it will be getting PTA duty free under the advance licence scheme. The move of the company is surprising due to glut in the polyester fibre market. The move to re-open the plant perhaps indicates an effort being put by the UK parents to mend matters though none is prepared to buy the argument.

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Industrial alcohol

It is regrettable that State Governments are taking long to withdraw their levies on industrial alcohol. The full bench of the Supreme Court invalidated these levies nearly three months ago while disposing of the Synthetics and Chemicals case. Yet, barring Maharashtra, no other State has taken effective steps in pursuance of the Supreme Court judgement.

Even the Maharashtra Government has not honoured the true intent and spirit of the judgement in as much as it has withdrawn the "transport fee" but introduced the "administration fee". In all fairness to the Maharashtra Government it must, however be noted that the incidence of the administration fee is lower than that of the transport fee by about 30 paise per litre. Needless to add, alcohol-based industries strongly feel that the Government should have fixed the administration fee at a level significantly lower than the present rate of 20 paise per litre. Not surprisingly, user industries want the Union Government to look into the matter.

The immediate concern of user industries is however, the imbalance between demand and supply of industrial alcohol. In fact, user industries have urged the Government to ban exports of industrial alcohol. As is only to be expected distilleries oppose this demand. It needs to be emphasised that during the last season (November-October) the distillery industry was bedevilled by huge unsold stocks. Many distilleries encountered serious storage difficulties. Some of the them were constrained even to suspend production for a while. It was in these circumstances that the Government permitted exports of industrial alcohol and relieved the distillery industry of the burden of unsold stocks. This, coupled with the fact that the supply of industrial alcohol is expected to rise during the current year, seems to suggest that th
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n costs in coal mining

not satisfactory. The overall realisation of production from these projects is only 50 per cent and the main causes of delay are in establishment of mine entries like shafts and inclines, slow development of underground working and inadequate geological knowledge of the geomining conditions prevailing in a mine.

Pointing out the causes of delays in implementation in a paper entitled "Planning preparedness and project implementation" Mr. S. Radhakrishna, Advisor (Projects), at the national seminar on future of coal mining, Department of Coal and Mr. G. Sengupta, Deputy CE suggested the follwing measures:

Strengthening and streamlining "contract management services" in coal companies; Formation of a construction wing with or without foreign collaboration, to undertake shaft sinking, incline drivages and construction of other infrastructural activities.

Improving the present system of interpretation of underground geomining conditions by application of more geophysical inputs, and coal companies should monitor cost parameters in the same manner as they do time schedule for project construction. For this a suitable package for monitoring resource-based network through computers is to be adopted.

The authors pointed out that though Coal India Ltd. has formulated a contract management manual, the formation of an effective contract management service wing, at the company level is yet to take place. As a result, jobs like construction of coal handling plants and railway sidings are inordinately delayed in procedural wrangles. Though Rail- [illegible] jects would be completed at least if construction of CHP and railway sidings are expedited.

A departmental construction wing has also been suggested to be formed for fast drivage of shaft and inclines, with collaboration in the form of consultancy services obtained from the USSR, Poland and FRG. In a paper on "Future trends in coal mining technology", Dr. M.M. Seam, Additional Chief Mining Engineer, Mining Technology Division of CMPDI in Ranchi, stated mechanised underground mining took its start only in the late seventies and as such development of equipments required for this is still in its infancy.

Seeing the critical role that underground mining technology has to play in the coming decades, especially beyond 2000 AD, it is imperative that this sector be encouraged to fabricate and design these equipment, under licence or otherwise, to the maximum. Such equipment include items like side discharge loaders, load haul dumpers, longwall equipment like shearers, ploughs powered supports, armoured flexible conveyors, underground telecom and telemonitoring equipment, roof bolters etc.

FOREIGN BANKS CUT RIL AGENTS BILL FACILITY

Discounting of bills facility provided to various agents of Reliance Industries Ltd. (RIL) by some of the foreign banks such as Duetsche Bank, American Express Bank, and Bank of Commerce and Credit International Ltd., has been drastically reduced. These banks have been using their discretionary powers liberally with respect to the agents of RIL. They appear to have grown more cautious now. It is further learnt from informed sources that the delivery of [illegible]

EIGHTH PLAN

Rs. 2,000 crore for fertiliser industry

The Deputy Prime Minister, Mr. Devi Lal, announced that an investment of Rs. 2,000 crores would be made in the fertiliser industry during the Eighth Plan. Addressing a press conference at Surajkund near Delhi, Mr. Devi Lal, who is also the Agriculture Minister, said the investment to be made in public, private and cooperative sectors was intended to create an additional capacity of 3.2 million tonnes of nitrogen and 1.5 million tonnes of phosphates.

During the Eighth Plan (1990-95), the major plants which are expected to be set up and commissioned are nitrogenous plants at Kakinada, Babrala, Gadepan and Shahjahanpur in the private sector and expansion of the existing capacity of Aonla plant in the cooperative sector, he said. Besides, further new capacity would have to be created in the industry and for that public and cooperative sectors would continue to play an important role, he said.

Mr. Devi Lal said full credit should go to the farmers for increasing food production even though the monsoon this year was less favourable than that of last year. He said the government also expected record production of sugarcane which would be around 210 million tonnes and cotton, about 102 lakh bales. About the National Front's promise of writing off debts of small and marginal farmers, agricultural labourers and artisans, he said the government would spell out the details in this regard in the Union budget for 1990-91.

USSR SHOWS INTEREST IN IMPORTING PSF

The Soviet Union has shown interest in importing polyester staple fibre (PSF) and polypropylene yarn from India. The Soviet in
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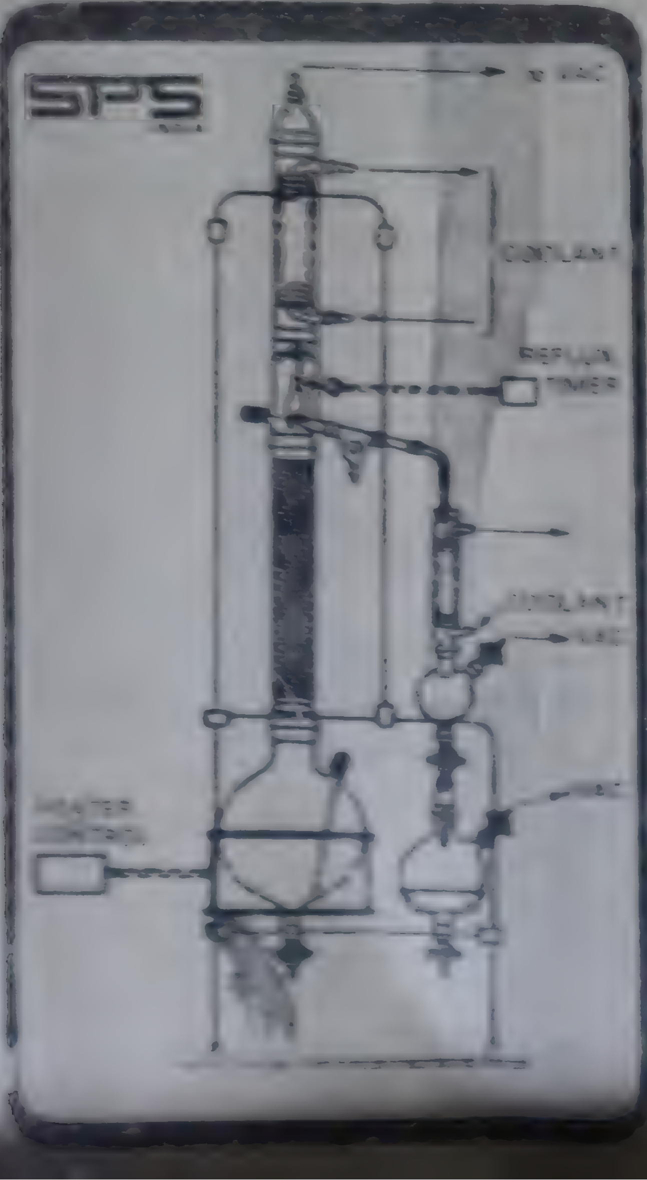

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second source of electric power, again operating through a generator. In other words, a second source of electricity is obtained without burning additional fuel.

If the station also has cogeneration equipment, the main elements of which are condensers, it can also produce district heating. However, this reduces the amount of electricity produced by the steam turbine. The key technology in a combined-cycle station is the gas turbine. Such turbines range from a few megawatts up to more than 200 MW.

For power stations, industrial gas turbines rather than aero-engine-derived units are used. Jet engine derived units, in operation on all rigs, for example, require extensive maintenance every 500-1,000 hrs., a time period completely unacceptable to power station operators. One of the critical elements of design in a gas turbine, apart from the turbine blades, is the cooling system. The temperature of hot gases in the turbine can be as high as 1,300°C. A typical 600 MW plant would use three 150 MW gas turbines, each about 26 metres long.

— The Hindu

DEVICE TO MEASURE MAGNETIC FIELD OF HEART

Soviet scientists have become the first in the world to use a high-temp. superconductor to measure the tiny magnetic field produced by the human heartbeat. They used a compound of yttrium, barium, copper and oxygen to form a SQUID — a superconducting material sensitive to changes in the magnetic flux passing at right angles to the ring which is formed of a chunk of superconducting materials and a sector which the scientists thinned out using a scalpel. This region acts as a weak link and will pass a current of a few micro amps. The current through the weak link, and hence the magnetic field within the ring of the SQUID, is monitored with a tiny electric field oscillating at radio frequency. The scientists pick up this field using a radio receiver.

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Instruments demand in Eighth Plan may double

Demand for scientific and industrial equipment in the country is likely to register a phenomenal growth of about Rs. 1,000 crores per annum by the end of the Eighth Five Year Plan, according to Mr. Vinay Toshniwal, president of All-India Instruments Manufacturers and Dealers Association.

Of this, Mr. Toshniwal said, the demand for indigenously manufactured instruments could be about Rs. 700 crores — a two fold increase from the present demand level, and that for foreign instruments about Rs. 300 crores. The imported instruments would constitute mainly the sophisticated ones for use in high calibre R & D work, in health care etc.

Mr. Toshniwal has asked the government to change some of the existing policies for providing the necessary foreign exchange required to maintain the sophisticated imported instruments with minimum downtime. For instance, at times of emergency when foreign technicians come to India for repairing the faulty instruments, the existing import procedures do not permit them to bring spare parts. This in turn cripples the vital functions at the R & D centre.

Similarly, the government policy in respect of after-sales service needed immediate change, because the Indian agents' licence for importing spares does not entitle them to import PCBs without effective repairs and maintenance of an instrument was not possible, he said. He said that the small-scale sector has been traditionally producing the instruments and catering to both the domestic and foreign markets. But of late, large Indian business houses had entered the field. For instance, Tatas have entered into a colla tions with Honeywell with Gould for mak

ANILINE PROJECT GRANTED LI

Polyolefin Industries received a letter of inte ufacture of 20,000 tonne aniline. The project is to in Bharuch district, a ba in Gujarat, at approxi Rs. 46 crores. In view of shortage faced by the con ers, the Government h considered the PIL's app industrial licence for anil a major consumer of rubber chemicals and has financial capabilities to ma cater to the needs of con tries. PIL is in an advance cussions with various c technology tie-up and to lise the same very soon.

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Railways to bring Cauvery crude to Madras

With an increase in crude oil production from the Cauvery onland basin, the Oil and Natural Gas Commission (ONGC) will soon be switching over the ferrying crude by rail tankers from Nagapattinam to Tondiarpet, according to Mr. V.C. Mohan, Director, Southern Region, ONGC. A pipeline is being laid to transport the crude from Tondiarpet to Madras Refineries Limited (MRL), Manali and it will be completed by the end of next month. It might be formally inaugurated on April 14. Crude from Thanjavur is now brought to MRL in road tankers.

The ONGC is now producing 700 tonnes of oil a day from Narimanam, Nannilam, Kovilkalappal and Adiyakkamangalam in Thanjavur district in the Cauvery onland basin, Mr. Mohan told a press conference at Madras recently. "This quantity is quite sufficient for rail transportation. So we are setting up a rail terminal at Nagapattinam", he said. The terminal is under testing now. The ONGC is now drilling one more well at Adiyakkamangalam, three at Narimanam and one at Vettikkadu. The one at Arumalai is under logging. Two wells are also being drilled in locations code-named PY-3 and PY-1 in the Cauvery offshore region.

Answering a question, Mr. Mohan said preliminary production of oil from the three wells already drilled in PY-3 structure will begin by April 1990-91. The PY-3 could produce 7,500 barrels of oil a day. Production of free gas from PY-1 will begin in about a year's time and after its integration with PY-3, the gas production from the two structures will be of the order of 0.5 million cubic metres a day. The development scheme for PY-1 and 3 include drilling of additional wells, platforms for treating oil and gas, metering and production facilities and pipelines to transport oil and gas. These will cost several hundred [illegible]

Under an agreement with the ONGC, the Soviets are now prospecting for hydrocarbons at Andimadam, Tirukkadaiyur and Bhuvanagiri in the Ariyalur-Pondicherry sub-basin.

The ONGC is also finalising its feasibility report on setting up production facilities in the Ravva offshore structure in the Krishna-Godavari basin. The structure will yield a few thousand barrels of oil a day. (Ravva in Telugu means diamond. The ONGC has named several of its offshore finds after precious stones viz. Heera, Panna, Neelam).

Royalty issue

Answering a question on the Tamil Nadu Government's demand for royalty for the oil produced from the Cauvery basin, the Regional Director said the ONGC has been paying royalty to the State Government ever since it started producing hydrocarbons in Tamil Nadu. The amount paid now is about Rs. 200 for a tonne of oil.

A fee is also paid to the State Government for exploring oil/gas onland. It is paid to the Union Government if the exploration is offshore. When oil is struck the ONGC enters into a mining lease with the State Government. The Centre decides the royalty amount and "if the State Government wants more, it has to talk to the Central Government," he said.

The production of oil from the Cauvery basin in 1989-90 was 0.2 million tonnes and the target for 1990-91 is 0.5 million tonnes. The production of crude from both the Krishna-Godavari and Cauvery basins by the end of the Eighth Plan would reach 3.5 million tonnes. The number of rigs looking for oil in both the onland and offshore regions of the Krishna-Godavari and Cauvery basins will double soon from the present [illegible]

[illegible] duction of oil and gas Mr. Mohan added.

ONGC "SAVES" Rs FOREX

The Oil and Natura
(ONGC) has claimed
eign exchange worth
1989 with more India
viding equipment, ma
ces for its projects.

ONGC's annual
equipment, material a
year 1988-89 was
crores. The saving of
worth Rs. 850 crore w
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"significant". Six ye
per cent of is pro
obtained from Indian s
cial spokesman said

ONGC has simplifi
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exchange and is trying
government to do the
Indian industries in the
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have been empowered

Efforts were also bei
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Rate contracts are
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Meanwhile, the ONG
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education and training and the strengthening of information systems built around the International Centre for Genetic Engineering and Biotechnology and the International Agricultural Research centres. The other key response should be an international agreement governing equal access to plant genetic resources for all the countries. The United Nations centre on Transnational Corporation must play a role in strengthening the developing countries' negotiating capacity. The developing countries should be helped in building a technology base of their own, arrest their brain drain, network their research and learning centres.

BIOTECHNOLOGY ASSOCIATE SCHEME

Twenty five scientists have been selected for associateships under the biotechnology overseas associate scheme for the year 1989-90. Long-term associateships are being awarded to Dr. R.K. Sharma, Dr. K. C. Bansal, Dr. Shekhar Majumdar, Dr. S. Tara Devi, Dr. J.M. Naidu, Dr. Bhaskar Sharma, Dr. Veilchetty Hanumanta Rao, Dr. Wahajul Haq, Dr. T.M. Vatsala, Dr. Jamuna Rajagopalan, Dr. Arun Kumar Sharma, Dr. P.N. Gambhir, Dr. K.K. Narayanan and Dr. C. S. Paul. The following ten have been selected for short-term associateship: Dr. Salil Kumar Bose, Dr. Rajendra Prasad, Dr. D.N. Deobagkar, Dr. Tapan Chakrabarti, Dr. P.K. Ranjekar, Dr. Kunthala Jayaraman, Dr. Rashid Ali, Dr. Satish Kumar Gupta, Dr. P. S. Rao, Dr. Vinod Bihari and Dr. G. Ramananda Rao. According to an official release under the biotechnology overseas associateship scheme, two categories of associateships, long-term and short-term are awarded every year. While the long-term awards are tenable for one to two years, the short-term awards are for three months only.

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Aluminium import duty hike on cards

Import duty on aluminium is likely to go up, according to Mr. Aditya Birla, Chairman, Hindalco Industries. Mr. Birla said that this is being done to protect aluminium manufacturers who are facing glut. The prices in international markets have fallen. As per the latest reports, aluminium was quoted on the London Metal Exchange (LME) at $ 1,600 per tonne. The existing import duty is five per cent ad valorem plus Rs. 2,500.

Estimates show that aluminium production of 4,00,000 tonnes in 1988-89 exceeded the demand of 3,90,000 tonnes. The production is likely to reach 4,70,000 tonnes in 1989-90 and 5,80,000 tonnes in 1994-95. The demand in 1989-90 is estimated at 4,30,000 tonnes, 6,15,000 tonnes in 1994-95 and 8,50,000 tonnes in 1999-2000. Aluminium imports in 1988-89 are estimated at 10,000 tonnes, 35,000 tonnes in1994-95 and 2,70,000 tonnes 1999-2000.

The installed capacity was 5,80,000 tonnes in 1988-89 and is likely to reach 6,10,000 tonnes in 1989-90. During the years 1994-95 and 1999-2000, the installed capacity is likely to remain at 6,10,000 tonnes. The pricing and distribution of aluminium has been decontrolled with effect from March 31, 1989.

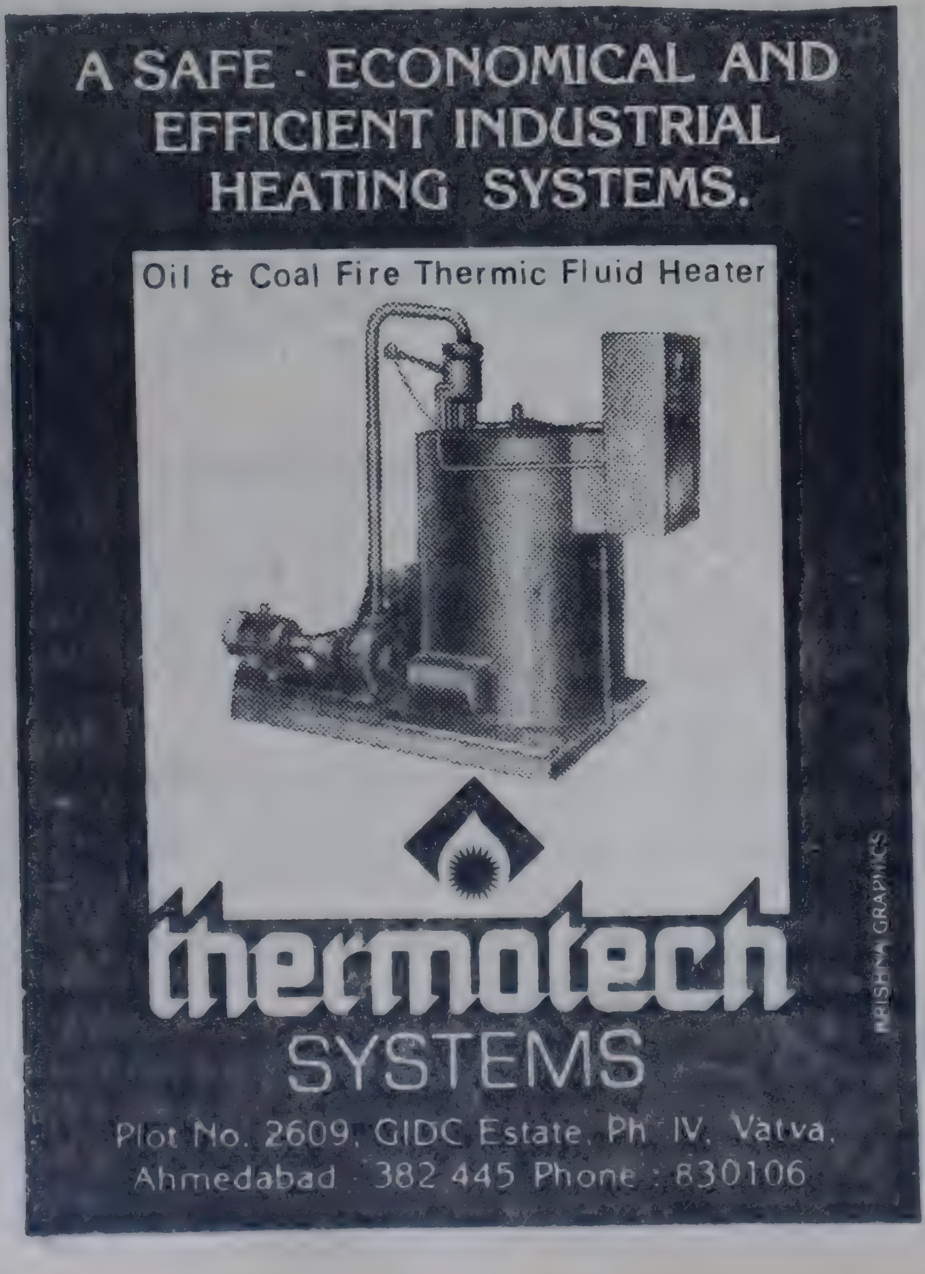
It is felt that there is an immediate need to increase the production capacity, to reduce dependence on imports. Imports would cause a heavy drain on the already strained foreign exchange resources. Creation of additional production capacity will not only make India self-sufficient in meeting the growing demand, but also make it an exporter of aluminium.

The world output figures have shown a rise during the first five months of 1989. The latest available figures have been widely predicted to show a tinuing rise in production. The considered to be in line with the forecast of surplus aluminium According to an estimate, the supply during the year is expected up by 2.1 per cent to 14.45 tonnes and consumption by only cent to 14.21 million tonnes.

Consumption increased from tonnes per annum in 1950 to 3 tonnes at present, attaining a growth rate of more than eight per per annum.

The Government has estimated during the current year, the total production by the primary metal producers would be around 4,00,000 against as estimated total demand about 3,85,000 tonnes.

According to a forecast issued by European Aluminium Association demand for primary aluminium is likely to rise by more than one per in Western Europe from last year million tonnes.



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KRISHNA GRAPHICS

ORISSA POLY-SACK UNITS' PLEA FOR DUTY REDUCTION

The Orissa HDPE woven sacks manufacturers' Association has appealed the Union finance ministry to reconsider the ministry's decision to raise the import duty on plastic raw materials. a letter to the finance minister, Mr. tendra K. Mohanty, the president of the association has said that Polyolefins Industries Ltd (PIL), the lone producer of HDPE granules (tape grade) in the country, had been supplying hardly about seven per cent of the requirements in Orissa, balance being met through direct imports or on high seas basis.

HDPE granules had presently costing around Rs. 36 to 39/kg. ing a customs duty element of The latest increase would impair working in the small scale

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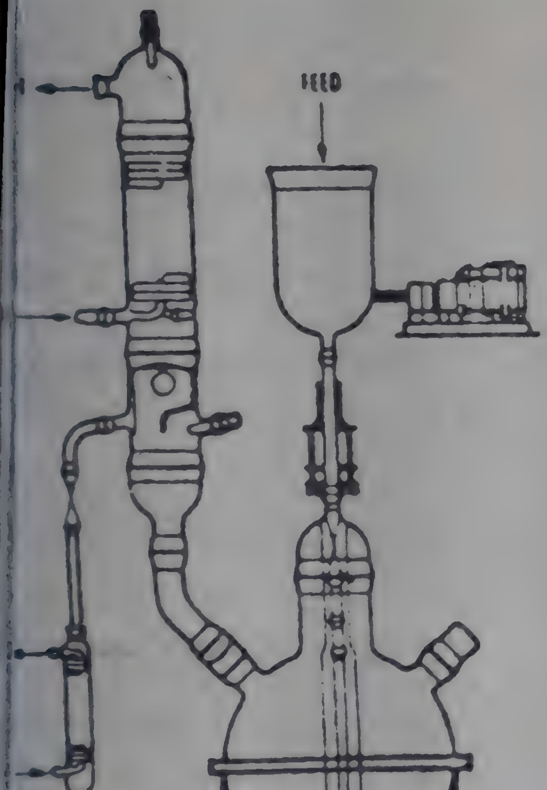

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RIYA GAS CRACKER DOWNSTREAM UNITS

Product mix review sought

The Gas Authority of India Limited GAIL) is seeking a review of the pro- uct mix for the downstream units based n the Auriya gas cracker.

The Auriya gas cracker, to be set up y GAIL, is to have an initial capacity o produce about three lakh tonnes per nnum of ethylene. The Project Approval Board had allocated 50 per cent of ethylene to GAIL and 50 per cent to the C. K. Birla group for utilisation in downstream units.

GAIL was asked to set up one unit to produce low density polyethylene LDPE) and another to produce polyvinyl chloride (PVC) at an estimated cost of about Rs. 600 crores. The LDPE unit was to have a capacity of about one lakh tonnes per annum and the PVC unit about 1.10 lakh tonnes per annum. GAIL's original proposal was for an LLDPE unit instead of a PVC unit.

The C. K. Birla group was allowed to set up high density polyethylene (HDPE) and linear low density polyethylene (LLDPE) units at an estimated cost of about Rs. 300 crores with facilities for swinging capacity between LLDPE and HDPE.

GAIL has, however, found that the PVC unit would not be economical for it. First, the capital cost of the PVC unit would be very high because of the extra chlorine plant which will have to be put up. Secondly, large quantities of salt will have to be moved from Saurashtra to Auriya for this unit. The caustic soda to be produced in the unit will have to find a market in the Nalco plant in Orissa.

Thus, while there will be a market for PVC in the region, the economics of it may work out to be be
plant like that being s

The proposal made
government now is to e
capacity of the other do
units being set up at A
setting up of a polypro
of the PVC unit to fully
from the gas cracker.
could also be consider

Meanwhile, GAIL
received three offers fro
panies for the gas se
being set up by as part o
complex.

The recovery facilities
propane are proposed
EIL.

For the gas cracker
several offers which ar
shortly. The Auriya ga
plex is estimated to
crores. A provision of
crores has been made in
for the Auriya gas cra
total outlay of Rs. 310
approved by the Planni

Interestingly, while
Committee on Eco
(CCEA) had approved
of intent to GAIL for
cracker, the downstream
this cracker are yet to re
ance of the CCEA.

PM TO OPEN SCIEN COCHIN

The Prime Minister,
will inaugurate the 78
four-day Indian Science
Cochin University of
Technology campus at
ruary 4.

According to official
Singh will reach Cochin
of February 3, on a
Kerala.

IMPORTED DRUGS

Available Ex-Stock

Sl. No.	Goods	Make	Packing
1.	Vitamin B6	Yugoslavia	25 Kgs.
2.	Aminophylline HCl BP 80	China	25 Kgs.
3.	Tannic Acid BP 80 Fluffy	Belgium	50 Kgs.
4.	Theophylline Anhydrous	China	25 Kgs.
5.	Aji-no-moto	Brazil	100 Lbs.
6.	Atropine Methylnitrate IP/BP	West Germany	100 gms. each
7.	Homatropine Methylbromide		
8.	llysine	Korea	10 Kgs

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INERIES

dying forex angle

Ministry and a clear indication could well be available in a month's time. But all this has not dampened the enthusiasm of the two promoters.

The Mangalore Refinery promoted jointly by Mr. Aditya Birla of the Indian Rayon Corporation and Hindustan Petroleum have estimated the cost around Rs. 1,400 crores inclusive of duty. But the Planning Commission is not very keen on naphtha crackers and would like to push the refinery capacity to six million tonnes per annum. The cost for a six million tonne per annum unit is put at around Rs. 1,100 crores with an foreign exchange outgo of Rs. 400 crores.

Mr. Birla is trying his best to get the cracker and the political equations favour him. And Mr. Birla is clever in asking for a cracker as refinery prices are controlled by the Government. A fixed rate of 12 per cent post-tax return on equity after providing for interest and depreciation is allowed by the Government. This works out to 24 per cent per annum on a pre-tax basis at 90 per cent capacity utilisation. As products from a cracker are free of price interventions, the entire idea makes economic sense. The detailed project report of the Mangalore Refinery made by Lummus-Crest of the U.S. has already got the pre-PIB (Public Investment Board) clearance. PIB will, however, await the review before finalising the deal.

In contrast, the Karnal Refinery, promoted jointly by Mr. Darbari Seth of Tata Chemicals and Mr. S.P. Khosla, Indian Oil Corporation, has drawn a lot of attention. The Centre is trying to sort out the differences between Mr. Seth and Mr. Khosla to speed up the process of setting up the project. Talks have been held but some crucial issues have to be clinched. IOC is keen on the

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knowhow of UOP of the US for setting up hydrocracking facilities while Tata Chemicals favour Chevron, again of the US.

Incidentally, for the Mangalore Refinery, Lummus Crest has identified Chevron for hydrocracking facilities which is a must to raise the yield of middle distillates. Indian Oil's preference is understandable as the UOP knowhow has been used for the Koyali Refinery.

But the more crucial issue is participation by the Russians who have agreed to offer a Rs. 600-crore line of credit at 2.5% interest with payments over 19 years. The Union Government is insisting on utilising the Soviet credit and the joint sector partners are agreeable.

But laced to the Soviet offer are two options. Under the first, the Soviets will offer technical assistance and buy US technologies for the project with a promise to arrange dollar credit. The second is a turnkey offer with the Russians setting up the project.

A turnkey offer places the cost of the Karnal Refinery at a massive Rs. 2,600 crores which will make the oil products extremely costly. Both Tatas and IOC are against the turnkey at this price and talks have started with the Russians to bring down the prices.

Reports are that the Russians are prepared to restudy costs as the Tatas feel the cost of the refinery should not be more than Rs. 1,600 crores with an oil pipeline costing another Rs. 200 crores.

IOC has had a bitter experience with the Russians on setting up the Mathura Refinery. In the latter case, Russian equipment did not match Indian supplies with none having any control. Both Tata Chemicals and Indian Oil Corporation insist on penalties if the Russians take up the project on a turnkey basis and lift costs or delay implementation.

The Soviets seem to be agreeable though the Government has yet to sort out a major issue — import duty of 85 per cent on imported equipment. DGTD has said that supplies from Russia do not need indigenous clearance but the Finance Ministry is reluctant to cut import duty till project details are finalised. The Birlas and Tatas are keen on a 15 per cent import duty as it could cut costs.

All this means that till the Russian option is decided upon, PIB will not have a firm proposal from the Tatas. Tatas and IOC are prepared for the first Soviet offer of technical assistance and purchase of western technologies if the turnkey does not bring down costs.

It is a sad state of affairs that a country which requires petroleum products needs more than four years to formulate and finalise a plan of action to start work on just two refineries.

OIL IMPORTS TO COST Rs. 1,700 CRORES MORE

India's oil import bill is expected to rise sharply by over Rs. 1,700 crores in 1990-91 as domestic production and availability of crude and petroleum products will fall far short of demand.

`As the demand for petroleum products is estimated to be 58.9 million tonnes (a growth rate of 9.3 per cent over the previous year) and indigenous crude availability for 1990-91 will be only 32.9 million tonnes, at least about 19.5 million tonnes would have to be imported, oil industry sources said.

Product import for the next year is to be 12 million tonnes, representing a total import of 31.5 million tonnes, valued at Rs. 8,230 crores.

With an expected export of 1.8 million tonnes of naphtha, fuel-oil and NGL valued at Rs. 480 crores, the net import bill next year would be
crores, a steep increase over
year, sources said.

In the current year, 1989
of crude and petroleum pro
touch 24.6 million tonnes
over Rs. 5,980 crores.

With demand projected at
lion tonnes in 1994-95, almo
of the Eighth Plan period, and
million tonnes by the turn of
or end of the Ninth Plan, it wo
sitate importing around 36
tonnes of crude and products
and 57.8 million tonnes by 19

This is based on the assum
all the three refineries at Kar
galore and Assam are com
and marginal capacity exp
planned at existing refineries

Import bills are bound to
the decade at an alarming
assuming higher yields of cru
indigenous sources. But it is
cult to project the exact qu
import bill during the decad
would depend on the fluctua
oil prices in the world mark

Oil industry sources said
sector Indian Oil Corporation
canalising agency, would nee
cise greater judgement
restraint while procuring crude
from the highly volatile oil
around the world.

The sources also say that th
infrastructure cannot handle
volume of imports of crude
ducts that are estimated to be
during the decade.

With the availability of dist
ducts like kerosene, diesel and
in international markets
become scarce, there is an
need to increase the present
capacity in the country of
tonnes, the sources said.

ponse positive to Southern gas grid

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like Assam and Tri-

Bangladesh could also share the gas. Needless to say, all this is still in a very nebulous stage", he said. The ministry, he added was also considering the recent Iranian proposal for piping gas from Bandar Abbas to Calcutta. "But our first priority will obviously be to try and see how we can minimise the wastage of gas in Bombay High", he said.

Mr. Gurupadaswamy also stated that he was toying with the idea of introducing a "completely comprehensive system", first in Delhi and then in Bombay, whereby gas could be piped to every home to take care of the energy and fuel needs.

Officials in the ministry, he said, were engaged in an exercise of working out the costs of such a project (involving the participation of the Gas Authority of India Ltd.) and which would have to be approved by the Planning Commission and the Union Cabinet. Such a project would, he said, also reduce the pressure on LPG cylinders which were currently being imported through the already saturated ports of Bombay and Vizag. The government was now thinking of importing LPG cylinders through other ports also, he said.

MPL TO COMMENCE PRODUCTION IN APRIL

With 90 per cent of civil and other engineering work in the prestigeous Rs. 100-crore Manali Petrochemical Ltd. (MPL) project being over it is all set to go on trial production in April 1990.

Announcing this at a press conference at Madras, Mr. A.C. Muthiah, chairman, and Mr. G. Raghavendran, managing director, stated that the required machinery from abroad has landed and work is in full swing.

This 100 per cent import substitute project will save nearly Rs. 34 crores of foreign exchange for the country. The project is coming up at Manali near Madras for manufacturing propylene oxide, propylene glycol and polyols with a capacity of 12,000 TPA and 6,000 TPA respectively. At present, all these items are imported, costing the nation around Rs. 60 crores annually, it was stated at the press meet.

To part-finance the project, being set up in collaboration with France and USA, the MPL is coming out with an issue of 160 lakh equity shares of Rs. 10 each on January 29 for the Indian public. MPL has been promoted by the SPIC with equity participation worth Rs. 11.40 crores.

Mr. Muthiah stated that the product will have a good demand in the country. The two main raw materials — propylene and chlorine — will be supplied by the MRL as well as SPIC, which will supply gaseous chlorine after purification stage.

GUJARAT CRUDE PRODUCTION HITS ALL-TIME HIGH

Crude oil production from Gujarat, one of the country's major contributors of oil, rose to an all-time high of 6.74 million metric tonnes (MMT), in 1989, following the adoption of new drilling techniques and accelerated efforts.

An Oil and Natural Gas Commission (ONGC) spokesman, said recently that about 4.1 MMT of this came from North Gujarat fields while the rest from South Gujarat. Similarly, total gas supply during 1989 was about 922 million cubic metres as against 825 achieved in 1988.

Of this, South Gujarat contributed 554 million cubic metres while North Gujarat gas fields supplied 367 million cubic metres, the spokesman said. Major discoveries in the region during the Seventh Plan include Nanda, Bechraji and Gandhar.

ONGC strategy to raise recovery from NE region

The Oil and Natural Gas Commission (ONGC) has drawn up a strategy to enhance oil recovery to 40 per cent from the fields in Assam and Nagaland. A study has revealed that it was possible to achieve this from both the developed and developing fields through application of water injection infill drilling and enhanced oil recovery (EOR) techniques, on ONGC spokesman said.

The total inplace geological reserves in Assam and Nagaland are estimated to be 438 million tonnes. Of this, the study has focussed on enhancing recovery from a balance of about 284 million tonnes of reserves. The recoverable reserves from fields like Lakwa, Geleki, Rudrasagar, Lakhmani, Borholla-Chanpang and Demulgaon total 111 million tonnes.

The ultimate recoverable reserves could be even higher when the recently discovered structures like Sonari, Khoraghat, Chamgmaigaon and Namti are included, the spokesman said. According to the spokesman, the major contribution to the reserves was likely to come from water injection and pressure maintenance, identification and production of undrained oil and application of EOR methods.

Pressure maintenance is being planned right from the start in new fields like Demulgaon, Sonari, Khoraghat and Uriamghat, he said. Infill drilling has already been initiated in the Lakwa and Rudrasagar fields to accelerate production and increase recovery.

Additional reperforation of wells had also resulted in increasing production by 560 tonnes per day. Two EOR schemes are also ready for implementation in the region: the LPG miscible gas process in Geleki field and water alternate gas process in Rudrasagar.

The incremental recovery in the case of the LPG miscible scheme is expected to be 17% and the additional recovery in Rudrasagar around 10%. According to the spokesman, activities in the north-eastern region had registered a three-fold increase since 1980-81. Oil production from the region is planned to be stepped up from 3.1 million tonnes by the end of 1989-90 to 5.11 million tonnes by 1994-95. Gas production from the area is expected to go up from two million cubic metres per day at present to nine million cubic metres by the end of the Eighth Plan period.

The number of wells drilled would increase from 102 in 1990-91 to 153 by 1994-95 and the number of rigs in operation is proposed to be raised from the present 25 to 65. So far, more than 130 structures have been identified by ONGC in the region, of which about 50 have been explored by drilling. The Khoraghat-Uriamghat area has been identified as one of the thrust areas in Assam. ONGC has established a separate project called the Dhansiri Valley project to intensify exploration in this area as also in the adjoining parts of the Assam-Arakan fold belt in Nagaland.

HOEC MAY BAG KUTCH BASIN OIL HUNT CONTRACT

The Hindustan Oil Exploration Company Limited (HOEC), the first and the only Indian venture for oil exploration in the private sector, may be awarded the contract for exploring the Kutch basin for oil. According to Mr. Aji Kapadia, managing director, HOEC and former chairman of GAIL, the company has applied to the Gujarat Government for petroleum exploration licence for the Kutch basin and was confident of bagging it. However, he told newsmen that since a licence for oil exploration in the private sector may be difficult under the existing regulations, the company may be asked to go ahead on contract basis. He said HOEC has signed a letter of intent with International Petrol ited (IPL), which is explori Krishna-Godavari offshore bl Kapadia said the company pr enter into a memorandum of un ding with Oil India Limited which the two companies woul explore areas that may be grant India Ltd. by the government to areas of exploration being m acceptable. The exploration of basin may be taken up immedi

Exploration apart, the compa made 19 per cent investment i equity of Gujarat Gas Compan ited, jointly promoted by Mafatl and GHC for distributing natura the Gujarat state to industrial, com cial and domestic consumers. The pany is entering the capital marke month to raise Rs. 10 crores for fina ing its exploration projects.

EXERCISE ON TO RATIONALI DRUG INDUSTRY'S GROWTH

Measures for rationalisation, qual control and the growth of the pharm ceuticals industry will be reviewed w the objective of ensuring adequate su plies of essential drugs to the comm man at reasonable prices, the Uni Minister for Petroleum and Chemica Mr. M.S. Gurupadaswamy, told ne persons recently at Bangalore.

"We want", he said, "to ensure th the production of drugs is increased a that self-sufficiency is achieved. W also want to ensure that the industry g remunerative prices so that furth investment is possible. I have instruct my officials to streamline licences a procedures in the matter of issuing licences for new plants and machinery he added. The minister also express concern about the bottlenecks in proc dures for importing essential medic like life-saving drugs. "Such dru which are not being made here a which are urgently required, shoul made available to people without a delay," he said.

andla-Bhatinda pipeline

nt has initiated a fresh
the tangle over the
da petroleum products
The finance ministry
ned a meeting of var-
concerned with the pro-
e initiative taken by the
minister, Mr. M.S. Gu-

had got bogged down in
oversies in the previous
ough it was found to be
omic considerations. The
the previous planning
pposed the project on the
it would deprive the rail-
r revenue. The Planning
, which had at one time
e project, rejected it later.

ission was, however, asked
Prime Minister's office to
ecision. This happened just
last elections to the Lok
vever, sensing that it could
a source of embarrassment
g party in Gujarat, the Prime
office hastily withdrew the
review the decision. It was,
eft to the new government to
sion in the matter. However,
o petroleum ministry sour-
cision may be taken on the
ore the end of next month.

t of the project, excluding
and terminal facilities, is
at Rs. 658.97 crores. The pro-
h is proposed to be financed
of the World Bank loan, will
onths to complete. The pro-
aiting clearance of the cabi-
ittee on economic affairs
The pipeline is intended to
six million tonnes per annum
um products to the north-west
The petroleum ministry has
the railways' stand that the
would lead to loss of revenue
. According to the ministry, the
deficit of petroleum products in the north-west region is much higher than what can be transported by the railways, and that pipelines are the cheapest and the most assured mode of transporting petroleum products.

The Kandla-Bhatinda pipeline project was cleared by the Public Investment Board (PIB) in January 1989. It was found that the transport of products by pipeline would be about 2.5 times cheaper than by the railways. A fresh appraisal was then made by the PIB on the basis of the data supplied by the railways, but the cost of transport by the rail route still worked out be quite high. Moreover, some of the data furnished by the railways and basis of their calculation were not acceptable to the appraisal agencies.

It was argued that the cost of conversion of 700 km of rail track from metre gauge to broad gauge would be Rs. 450 crores, while another Rs. 400 crores would be required for the rolling stock. This would be much more than the total investment on pipeline which was then estimated at Rs. 680 crores. The pipeline would also save about Rs. 70 crore per annum in operating costs.

ANOTHER REFINERY LIKELY IN TAMIL NADU

The long-drawn dream of Tamil Nadu to have another "refinery" is nearing fulfilment. According to informed sources, the Centre has cleared almost all the crucial formalities for setting up what is here "a mini-refinery" in the state to make use of the Narimanam outflow. The project report is now before the PIB for final vetting. After that, it will go to the cabinet sub-committee for approval.

Ever since oil and gas was found at Narimanam four years ago, there has it a mini refinery — within that area to avoid transportation cost and help the industrial growth of the area through the availability of associated gas there. The Tamil Nadu government had also been pressing the Centre to set up such a unit there and offered all infrastructural facilities. The proposed mini-refinery, when set up, will have the capacity of 0.5 million tonnes a year and the estimated cost is around Rs. 131 crores. The original cost was only Rs 100 crores. The increased outlay is due to the fact that the refinery will have a gas-separation plant also. Like Ankleshwar crude from Narimanam is "sweet" and of a fine variety. At present, crude from Narimanam is transported to Madras Refinery Limited at Madras for refining and other purposes.

Once the PIB clears the project, it will take another 30 months for completing construction and other civil works, said the sources. The potential for kicking up the growth of the area is estimated to be high and the Cauvery Basin stand to gain a lot from this project. At present nearly 500 tonnes of crude is transported every day from Narimanam to Madras for refining and further use.

TAMIL NADU TO GET ROYALTY FOR LIGNITE

The Union Government has agreed to pay Tamil Nadu a royalty of Rs. 2.50 per tonne for lignite mined by the Neyveli Lignite Corporation. This was disclosed by Chief Minister Mr. Karunanidhi while replying to Mr. K. Ramani during question hour in the state assembly.

Mr. Karunanidhi said the government had pressed the Union Government for payment dues of royalty of Rs. 46.41 crores, which included interest on the dues. He said the government would also press for royalty for the oil in the Narimanam area.

PLASTICS

Duty hike badly timed

Plastics are to cost more. Producers who make polymers as well as processors who covert them into colourful articles like trays, buckets, bags, pens, slippers and toys alike agree that prices will go up. Both also agree that polymer prices are perhaps the highest in India.

A perusal of the Indian and global polymer prices in recent years seems to bear out the wide disparity between Indian and international prices. The following were the global prices of major commodity plastics in March 1987. The prices charged by local producers during the time is given in brackets. LDPE $600 (Rs. 21,300), HDPE $760 (Rs. 21,000), PP $700 (Rs. 20,200), and PVC $560 (Rs. 18,000). Compare this with prices prevailing during December 1989. LDPE $880 (Rs. 30,500), HDPE $900 (Rs. 30,790), PP $850 (Rs. 31,000) and PVC $680 (Rs. 25,000).

In other words, against an 18 per cent increase in global HDPE price, the only Indian producer increased the price by 46.6 per cent, against a 21.4 per cent increase in global PP price, the sole Indian producer increased his price by 48.5 per cent, against a 21.4 per cent increase in global PP price, the sole Indian producer increased his price by 48.5 per cent, and against a 21.4 per cent increase in PVC price, the local producers have raised their prices by 38.8 per cent. The increase in LDPE has been the same in India and abroad.

In the polemics between producers and processors, the advantages that wider use of plastics can bring about to the society get sidelined. The general public, Government and even the rest of the industry think only of the industrial and consumer applications of plastics. The vast potential of plastics in agriculture remains untapped. Use of plastic mulch films and irrigation processes can reduce the frequency of irrigation by 50 per cent, help irrigate additional land, increase crop yield by 20 ro 80 per cent, depending on the type of crop and optimise the use of fertilisers. The duty hike has come at the wrong time. One polymer producer admitted: "When we were crying hoarse about crashing global prices, Govt. did nothing. The duty hike has now come when the prices are moving up." If only the Govt. had accepted the D.V. Kapur Committee's recommendation for a floating rate of import duty, the industry's trauma could have been avoided.

Grant of permission for setting up several new crackers had stirred up great interest in polymers in recent months. Financial institutions also reversed their earlier decision not to assist processing units. Processors and producers offices are alike plastered with "Plastindia" stickers, denoting the interest in new technologies and applications to be exhibited in the forthcoming Delhi fair. If new crackers are commissioned in the nineties and consumption polymers do not grow faster, the armchair critics who prophesy a PSF-like situation in polymers may well prove themselves correct, industry observers feel. (See p. 75 for table).

ENQUIRY INTO ION EXCHANGE CANCER DEATHS

The Inspector of Factories, Kalyan, Mr. S.D. Jagtap, is holding an enquiry into the cancer deaths at the Ambernath plant of Ion Exchange (India) Ltd. The results are expected to be known shortly. Nine workers at Ambernath have died since November '85, allegedly from cancer caused by the plant's operations. According to workers it is the poisoned atmosphere around the plant which is also causing severe chest problems. Even travelling on suburban trains has become a nightmare for them. The death of a worker Mr. B.N. Shetty on January 5 has been the proverbial last straw, according to the
workers have been on

The union leaders, Mr
Patil and Mr. Parashuram
the management represen
uary 18 and have deman
compensation from them
for Civil Supplies Mr N
also expressed his views
plant. The workers had
notice on January 12 wh
to Mr. Leslie D'Souza is to
strike, and also a can
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benefits. The managemen
its record on workers he
impeccable.

According to Mr. L.V. K
Works Manager "Our me
are open for all to see an
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Mr. Shetty is due to asth
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The company supports it
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has crossed its 15th day an
to the company the losses h
been to the tune of Rs. 30

MEET ON PARAXYLE DENIED

The Finance Ministry
"incorrect and baseless"
that the Finance Secretary,
Jalan, has called a special
reduction in the import d
xylene.

- PP	850	Previous	Non preferred								
		Revised	Non preferred	Rs. 7000	45%	30%	88.5%+Rs. 9100	17.09			
		Previous	Preferred	10%	30%	30%	82%	17.09	14527	26968	
		Revised	Preferred	Rs. 3500	45%	30%	88.5%+Rs. 4550	17.09	14527	32572	20.8
- HDPE	1000	Previous	Non preferred	20%	45%	30%	114.5%	17.09	17090	37391	
		Revised	Non preferred	Rs. 6400	45%	30%	88.5%+Rs. 8320	17.09	17090	41345	10.6
		Previous	Preferred	10%	45%	30%	101.5%	17.09	17090	35125	
		Revised	Preferred	Rs. 3200	45%	30%	88.5%+Rs. 4160	17.09	17090	37102	5.6
- PVC	650	Previous	Non preferred	Rs. 1000	Rs. 3000	40%	40%+Rs. 5600	17.09	11109	21576	
		Revised	Non preferred	Rs. 2000	Rs. 5000	40%	40%+Rs.9800	17.09	11109	25860	19.9
		Previous	Preferred	Rs. 500	Rs. 3000	40%	40%+Rs. 4900	17.09	11109	20862	
		Revised	Preferred	Rs. 1000	Rs. 5000	40%	40%+Rs. 8400	17.09	11109	24432	17.1
LDPE/ LLDPE	850	Previous	Non preferred	Rs. 2000	45%	30%	88.5%+Rs. 2600	17.09	14527	30583	
		Revised	Non preferred	Rs. 6200	45%	30%	88.5%+Rs. 8060	17.09	14527	36152	18.2
		Previous	Preferred	Rs. 1000	45%	30%	88.5%+Rs. 1300	17.09	14527	29257	
		Revised	Preferred	Rs. 3100	45%	30%	88.5%+Rs. 4030	17.09	14527	32042	9.5
PS	950	Previous	Non preferred	30%	30%	20%	92%	17.09	16236	31797	
		Revised	Non preferred	Rs. 17500	45%	20%	74%+Rs. 21000	17.09	16236	50236	58.0
		Previous	Preferred	15%	30%	20%	74%	17.09	16236	28816	
		Revised	Preferred	Rs. 8750	45%	20%	74%+Rs. 10500	17.09	16236	39526	37.2

-- **Shyam Kumar in Financial Express**

Plastic units in Gujarat: Backward areas favoured

The Gujarat Governor, Mr. R. K. Trivedi, said that the State Government could plan for plastic industrial estates in backward areas of the State. A plastic processing zone has been established at Sarigam near Surat, he added.

Mr. Trivedi who inaugurated the annual seminar on progress through plastics in "90s" organised by the Gujarat State Plastic Manufacturers' Association, stated that rather than concentrating on urban and developed markets, the manufacturers should focus on the development of rural markets and set up units in backward areas. It should be the endeavour of the State promotional agencies to help such units to become viable, he asserted.

Mr. Trivedi pointed out that the country is on the threshold of major developments in the field of petrochemicals and plastics. The expansion is bound to be quantitative and qualitative.

The imported raw materials will be considerably reduced with the commissioning of the new petrochemical complexes. The production range is also expected to enlarge with the manufacture of more engineering plastics.

The plastic manufacturers will, therefore, have to orient themselves to possibilities of expansion and changes in production structure. But, while planning new units, one should try to avoid concentration in already congested regions.

He pointed out that the south Gujarat region, is already having a heavy concentration of chemical industries. Apart from the problems of pollution, such concentration leads to migration of people from backward areas and creation of unhealthy living conditions.

An individual entrepreneur should be guided by advantages of facilities like transport and communications, the availability of a nearby market, etc. rather than the social cost of rural migration. This can be offset, to a large extent, by the creation of adequate infrastructural facilities by the Government agencies in backward areas, he added.

Mr. Trivedi opined that the most important sector which could benefit tremendously from the use of plastics in housing. Today, with timber getting scarcer and metal getting costlier, the developed countries are extensively using various types of plastics to substitute wood and metal in applications such as door, window frames and the like besides furnitures and fixtures.

Even from the ecological angle, pressure on forests for timber has got to be reduced and plastics could serve as saviours of our precious forests, he said.

GOVT. URGED TO CUT DUTY ON POLYMERS

The Plastics and Linoleums Export Promotion Council has expressed fear that a sudden hike in customs duty on polymers will adversely affect the production and exports by the plastic industry. It has urged the authorities to immediately bring down the duty in the interest of export promotion.

Mr. K. P. Gupta, chairman of the council, has welcomed the introduction of import duty on tonnage basis instead of ad valorem on major plastic raw materials. He, however, felt that hike in duty was unwarranted at present. It might make more units in small-scale plastic industry unhealthy, he added.

As far as exports of plastics are concerned, most of the small-scale units export under duty drawback scheme since they are not in a position to avail of the duty-free licence scheme due to
un-economic import
of raw material for

Since the devalu
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ALLOWED

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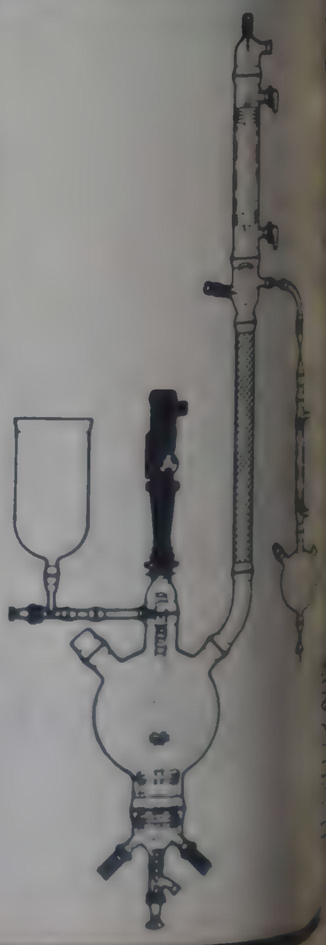

ALS TO ACHIEVE
TS

als Ltd. expects to
er of Rs. 6.50 lakhs
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damage to plant and
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reckoning, shares too
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nine months ended March
ne Chemicals' turnover
23.8 per cent (annualised)
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nt (annualised) to Rs. 371

tter management of input
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pany paid a dividend of 11.5
nine months ended March
gainst a dividend of 15 per cent paid for the 12 months period ended June 30, 1988.

At an increased installed capacity, capacity utilisation for activated calcium carbonate was 80 per cent against 83 per cent in the previous year. It was 93 per cent against 97 per cent for precipitated calcium carbonate.

During the nine month period under review, the company sold 5699.34 m.t. of activated calcium carbonate at an estimated value of Rs. 280 lakhs. It also sold 4354 m.t of precipated calcium carbonate valued at Rs. 173 lakhs.

Lime Chemicals Ltd. a nineteen year old company entered the capital market on October 4, 1986 with a public issue of 5.10 lakhs of Rs. 10 each at par. The issue was made to part finance the capital expenditure for the expansion and modernisation of the existing unit.

The company's unit for the manufacture of calcium carbonate is situated at MIDC Industrial Area, Roha. The company's product range includes precipated calcium carbonate — coated, uncoated and natural. These products are essential raw materials for the manufacture of toothpaste, cosmetics, rubber, PVC cables, paint, printing ink, pharmaceuticals, paper etc.

The clientele for these products include Colgate Palmolive, Geoffery Manners, Balsara Hygiene, Asian Paints, Finolex Cables, Indian Cables, NOCIL, Cable Corporation of India, etc. The notice to shareholders states that the management has sought consent to make investments in other corporate bodies in excess of the limits laid down under Section 372.

The company intend to invest in Silvo Liacal Chemicals Pvt. Ltd. engaged in the manufacture of ethylene oxide condensates and other speciality chemicals, Thirani Chemicals Ltd. engaged in manufacture of calcium carbonate and Regent Chemicals Ltd. engag
manufacture of paracetamol.

GGCL SCOUTING FOR KNOW-HOW

Gujarat Gas Company Ltd., (GGCL) promoted by Gujarat Industrial Investment Corporation and Arvind Mafatlal group is looking to leading gas distribution companies of Europe, including British Gas of UK and Sofregaz of France to upgrade its own know-how in gas distribution.

Gas transmission (what Gas Authority of India is doing through the HBJ pipeline) and gas distribution involve very different technologies. The latter involves depressurising of gas to low levels and an intricate network of valves and piping to deliver gas to industrial and household consumers.

GGCL's maiden venture in Ankleshwar-Bharuch belt, using its own know-how, is in an advanced stage of implementation. Enough pipeline has been laid to connect some 5,000 households out of a projected 10,000 to be covered. Twenty-seven industrial units have signed up with GGCL for receiving gas to fire their boilers which are now using conventional fuels like coal and furnace oil according to Mr. F. B. Virani, Managing Director. The company is also providing the technical advice on changeover of fuel to gas as the boiler has to be adapted for the purpose. The company has already started distribution of natural gas in Ankleshwar and distribution in Bharuch will start by this month end. The second project under implementation is for distribution at Surat for which an initial quantity of three lakh metre cube per day has been committed by the Oil and Natural Gas Commission. Both these projects will cater to the requirements of about 7.5 lakh people and more than 1000 commercial and industrial establishment.

GGCL has plans to distribute gas to

Ahmedabad city and surrounding areas and has carried out detailed market survey and techno-commercial studies. As per the survey, about five-lakh families in the city and suburbs will switch over to piped gas. In addition, some 700 small and medium-scale units and most of the city's textile mills are expected to change over to gas.

The present requirement of the city is about two million cubic metres a day (CMD) which will go upto 2.6 million CMD by the end of century. Due to the tremendous contribution towards pollution control possible through utilisation of gas, the State Government is keen on implementation of the project at the earliest and has requested the Union Government for committing gas supply for the purpose. GGCL is prepared to implement this project expeditiously with an estimated investment of Rs. 250 crores.

The ultimate aim of GGCL is to cater to major areas in Gujarat — ideally, from Vapi to Veravel.

HOECHST, LUPIN LAB BID TO TAKEOVER GUJARAT THEMIS

Lupin Laboratories and Hoechst India have emerged as suitors for Gujarat Themis Biosyn Ltd, a sick pharmaceutical unit. Several other units were in the fray but the choice has now narrowed to these two units.

Personnel from both companies have visited the plant at Vapi and are negotiating with the Industrial Development Bank of India (IDBI), the operating agency, and are to submit detailed financial and technical proposals for reviving the unit soon.

In spite of persistent efforts by the present management, the company has not come out of the woods and has continued to make losses. Accumulated losses as on March 31, 1989, stood at Rs. 11.23 crores, eroding the net worth.

In accordance with the provisions of Section 15 of the Sick Industrial Companies (Special Provisions) Act, the company has filed a reference with the Board of Industrial and Financial Reconstruction (BIFR).

At a meeting of representatives of the company, Gujarat Industrial Investment Corporation (GIIC), financial institutions, Life Insurance Corporation of India and Union Bank of India, IDBI was appointed the operating agency to frame a revival package for the company.

For Hoechst, the acquisition will provide an opportunity for diversifying into fermentation products, an area in which the parent company is a world leader.

Lupin, like several successful Indian drug companies, has also been keen on entering this field which is less crowded, hi-tech and has tremendous export potential. The existing facilities with the addition of balancing equipment can be deployed to manufacture other bulk drugs.

Indeed, the promoter originally had poposed future diversification into rifampicin, griseofulvin and the like, but losses in erythromycin operations snuffed out these ambitions.

Gujarat Themis was promoted in the joint sector by GIIC and Chemosyn Pvt. Ltd., in 1985 by Mr. Kantilal H. Shah the moving force behind the Themis group of companies. The company has an installed capacity to manufacture 46.2 tonnes per annum of erythromycin using indigenous knowhow.

Apart from producing the bulk drug from the basic stage, it has been converting the drug into salts and formulations like erythromycin estolate and stearate. Erythromycin is used in the treatment of infections including tonsilitis, bronchitis, pneumonia and diphtheria.

During the very first year of operations, the company suffered
to frequent power interrup
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During 1987-88, pr
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The bid by Lupin an
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Hoechst India is on the verge of a
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NISHA SYNTHETICS

Nisha Synthetics Limited, a com
engaged in texturising and twisting
polyester yarn, has started full fl
operations by commissioning it's

Encouraged by the favour
response received by the comp
products in the market, the dire
have drawn up plans for 100 pe
expansion, which will be comp
during this year.

The company also plans to
yarn dyeing at a later stage. Since
dyeing requires clearance from the P
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undertaken at a different locatio
tially, yarn dyeing capacity shall
TPA and it will be increased
TPA.

The company's recent publ
has received CCI approval for
under section 80CC of the Inco
Act, and all the shareholders sha
be able to avail the benefit.

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Science Briefs

HROUGH IN
CTIVITY

discoveries of novel
superconducting mate-
U.S based Indian ma-
r. M.A. Subramaniam
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Delaware was one of the
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, the Du Pont team was
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ng that these (doped)
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s (Tc) are 90°K (-183°C)
(-153°C).

-based:
nd patent has been granted
um-based superconducting
e some lanthanum atoms
substituted with sodium
ne fraction of sodium rang-
to 0.3. The formula of this
is given as (La, Na) CuO_4.
conducting phase has been
ave a Tc of about 40°K

The essential difference between this thallium-based compound and the other more common superconducting lanthanum compounds is that the oxygen stoichiometry is well determined: that is to say, the proportion of oxygen content is exactly known.

Superconductivity in the other lanthanum oxides was attained by having an undetermined excess of oxygen achieved through high temperature annealing of the oxide mixture in a high pressure oxygen environment.

In contrast, here the necessary electronic property in the crystal structure required for high Tc is sought by Dr. Subramaniam to be achieved in the cationic sector of the compound: by adding sodium in undetermined proportions. And this has been found to make preparation of the material much easier than high pressure annealing in an oxygen atmosphere.

Though Prof. C. N. R. Rao is reported to have found these thallium-based superconducting phases at around the same time the publication of Dr. Subramaniam's results were much before Prof.Rao's. Incidentally, Dr. Subramaniam is a former student of the IIT, Madras, having worked under Prof. G. V. Subba Rao in the Materials Sciences Department of the Institute.

Delivering an invited talk at the Conference on "High Tc Superconductors: Structures, defects, non-stoichiometry and Tc correlations", Dr. Subramaniam pointed to an interesting empirical observation which gives a sort of thumb rule to fabricate new materials with high superconducting transition temperatures.

His observation is that all the superconducting materials so far discovered seem to have a very small value range for the attribute known as electronegativity. The range in which all the materials have been found to fall is: 2.64 to 2.66.

Mixed valency property:

There are textbook rules for calculating this quantity in compounds like the new copper oxide high Tc materials. Electronegativity in these materials gives a measure of the effective negative charge on the group of radicals apart from the copper atoms, or equivalently, this is a measure of the positive charge state of copper in the crystal structure of the material which does not have a fixed value.

This mixed valency property as it is called, whether a copper atom is in a +2 charge state or in a +3 charge state, is known to play a very important role in high temperature superconductivity.

Therefore, if Dr. Subramaniam is right all that is required is to sit with Pauling's electronegativity formula and work out which atoms would do the trick of producing a compound with an average electronegativity that falls in the empirical range.

This empirical relation is not surprising because it is related to the proximity of copper and oxygen atoms in the active copper-oxide layers in the crystal lattice, known to be crucial for high Tc. But it is good to have a cooking recipe for high Tc, is what Dr. Subramaniam says.

Another prominent U.S. based Indian scientist in the field of high temperature superconductivity and attached to a corporate research and dopment setup is Dr. Pravin Chaudhuri of the IBM Research Division, Yorktown Heights, New York. He is part of a National Committee on Superconductivity formed by the U.S. President, Mr. George Bush, which will be submitting a report within a few months to the U.S. Congress recommending how the U.S. Government should plan to use the research done in the U.S. industry and research laboratories.

National efforts in U.S.:

Dr. Chaudhari and his colleagues at the IBM were the first to report the highest current densities of about a million amperes/sq.cm. in these novel superconducting oxide materials fairly in the game.

Talking on the nature of the national efforts in the U.S. in the field, Dr. Chaudhuri said that a consortium of companies and national laboratories has been formed, based on the recommendation made by the so-called Weismann Commission set up by the former President, Mr. Ronald Reagan. The consortium consists of the important American institutions like the IBM, AT & T, Bell Laboratories, MIT, Lincoln Laboratories, Du Pont, Los Alamos National Laboratory and others.

The consortium was formed after all the financial, legal and technology transfer aspects were taken care of, according to Dr. Chaudhuri. An estimated funding to the extent of $140 millions from the U.S. Government and $100 millions from the U.S. industry towards superconductivity research for the next year is being envisaged in the Committee's report.

Levitation transport vistas:

Apart from the electronics and the power sector industries, aerospace industry has also evinced keen interest in the area, Dr. Chaudhuri said.

However, the surface transport industry has shown very little interest in the magnetic levitation transport possibilities unlike as in Japan. Apart from the New York Senator, Mr. Moynihan there is no obvious interest from anywhere else, he said.

"The issue is not whether levitation is possible that certainly is. The question is whether one wants to do it," Dr. Chaudhuri said. Incidentally, Du Pont is also part of the Japanese consortium, through the Japanese subsidiary Du Pont (Japan), according to Dr. Subramaniam.

Talking of directions in basic research in the U.S. Dr. Chaudhuri said that material issues are still open though the so-called 123 compounds based on yttrium oxide are the easiest to prepare. Second in line are the bismuth-based compounds, he said. Through thallium compounds are toxic and therefore not preferred for large scale applications, they are likely to be exploited by small companies for applications like coating the insides of RF resonance cavities, he pointed out.

False alarm:

There has been steady progress in the U.S. in achieving high current densities in these oxide materials, he said. Dr. Chaudhuri feels that it was a false alarm in 1987 that high critical currents could be obtained only in thin foils. Very high current densities have been obtained in almost all single crystals of these oxide materials, he pointed out. In polycrystalline materials at 77K current densities as high as 6-8 million amperes/sq.cm. have been obtained at zero magnetic field, Dr. Chaudhuri said.

He referred to some recent work in Japan which had shown that in crystalline wires current densities higher than conventional low temperature superconductors could be obtained.

As regards field dependent current densities he pointed out to the significance of the recent work where in an oxide super conductor at 4K under a magnetic field of 25 tesla higher current densities than conventional metallic superconductor values had been obtained.

Scope for R & D in India

Indians can carve a niche in the global superconductivity scenario by channelising talent towards a few projects in the field, according to Dr. Chaudhuri. In an interview, he said the country should not only draw a long term programme for superconductivity research and applications, b a handful of ventures to ma in the interntional scene future. "The strategy should race with the big countries but choose a few areas", he

He said the country could on fabrication of squids (super ing quantum interference devic were state-of-the-art and mark for applications in medicine, and instrumentation. The exper gained in making squids could to produce superconductors, wi puter applications.

Dr. Chaudhuri said he and his col gues at the IBM Research Centr York, were the first to make a s The team, however, was working for last three years to overcome cer "practical problems" in utilising squids in contraptions that had comm cial applications. India could use a number of scientists for making squi he added.

Dr. Chaudhuri said IBM proposed use the squids as "learning vehicl for application of superconductors computers. As the market for squids too small for IBM, it might give squids to the US Navy for detection submarines or permit licensed manuf ture by small units, he added.

He said the first batch of superco ductors for commercial use in the are of medicine, geology and microwa communications would be out in next two years. He said he was current studying why "grain boundaries" superconducting wires and films h low current carrying capacities. If problem was not overcome, scientis would have to derive newer methods making the wire and films.

Dr. Chaudhuri said the magnetic fi lattice problem in superconducto raised by the sceptics was only a "re herring". Even the brittleness amon these systems could be solved, he a

y move in sight
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anagement Board headed by
R. Rao, director of the Indian
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Dhawan, Tata Electric Com-
TEC is watching world pro-
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vhile at least three Indian
ies claim to have developed
magnetic sensors called
(superconducting quantum
nce devices) that can be used
ping magnetic fields of the
ain and surveying the earth's
anomalies for oil exploration.

K. Arora of National Physical
ories, Delhi said the 'squid'
ed at NPL using HTSC material functions at liquid nitrogen temperature (-193°C).

Scientists at the solid state physics laboratory in New Delhi reported the development of infra-red detectors using high temperature super-conducting thin films produced in the laboratory, in infra-red detectors have applications in space.

Scientists at the Benaras Hindu University said they have developed a technique for making screen printed thick films on ceramic substrates. The final product was found to be superconducting up to a temperature of -163°C.

Meanwhile, a scientist of the National Physical Laboratory (NPL), Dr. A. V. Narlihar, claimed to have found the hottest superconductor but participants of the world conference on superconductivity were sceptical.

Shock treatment for conductivity

One shudders at the mention of explosions capable of blowing apart everything in sight, but not so for some scientists who have learnt to make use of the resulting shock waves to make better superconductors.

Scientists at the American multinational company, Allied Signal, are devising ways to channelise these shock waves to develop superconducting cables which are capable of transmitting electricity without any loss.

Dr. Zafar Iqbal, a senior researcher at Signal, who was in Bangalore to attend the international conference on superconductivity, said they have been able fabricate superconducting cable, with copper covering.

In their laboratory, explosions are created in a protected chamber. The shock waves created during the explosions generate very high pressure. Under the impact, the superconducting material is compressed to form thick cables. Through appropriate methods, it is possible to blend copp
the outer layer. This cable could be used to transmit electricity without any loss.

Superconductivity is a phenomenon by which certain materials offer no resistance to flow of electricity, unlike the modern-day metallic conductor, at a particular temperature known as critical temperature (TC). The highest TC achieved till today is 125 degrees Kelvin or -140° Centigrade. For practical applications TC has to be much higher and this is what scientists across the world are trying to achieve.

It need not be so, says Dr. Iqbal. His team is working towards enhancing the current-carrying capacity of superconducting cables rather than the TC which they think is more crucial.

They have been successful to some extent during the experiments. "We will be able to raise this in the near future", he says optimistically.

Another attempt is to make superconducting alloys, similar to metallic alloys. "This way we can take advantage of different materials exhibiting superconductivity."

Allied Signal has a $ 500-million defence ministry-sponsored project to develop superconducting motors with bearings made out of these materials. Such motors will be frictionless and could be used for levitating trains as well as in many military equipment.

Regarding the initial euphoria, when high-temperature superconductors were first claimed in 1986, Dr. Iqbal said, "it is dying out. Now it is just restrained excitement."

Future Prospects:

Sections of hospitals of the future may sport a new look. If all goes well, they will have screening-rooms constructed for superconducting materials. Such rooms will have no magnetic fields and will facilitate more accurate diagnoses of ailments of the heart, blood and the brain, says Dr. M. Cardadona, a German physicist.

When even the earth's natural magnetic field is absent in these rooms, it would be possible to detect the field created by the patient's blood cirulation and make accurate diagnosis.

Medical diagnostics would be revolutionised and there would be no need to use catheters, inserted into the heart, to learn more about it. This could be done using a superconducting magneto-cardiogram, thus eliminating the dangerous effects of inserting a catheter.

The other limiting factor could be the costs involved in maintaining the superconducting screening rooms at temperature much below the freezing point to take advantage of the phenomenon.

NEED FOR INTEGRATED STUDY OF GREENHOUSE EFFECT

There is a great need for integrated study and to generate more data on the various aspects of global warming and sealevel rise--the direct consequence of greenhouse effect. Scientists and technologists should take up more detailed and quantitative studies in relation to the Montreal Protocol, and come out with the right energy mix and more green and safe energy options.

Exploration of marine resources and flood modelling using space vessels and the study of the impact of deforestation on monsoon behaviour as also on conventional rains should be initiated. An integrated and holistic conservation strategy to preserve the biological diversity is another urgent need.

These are some of the recommendations of the two day national symposium on Indian Geosphere and Biosphere programme organised by the National Academy of Sciences recently at Hyderabad.

Dr. M. S. Swaminathan, president of the academy in his presidential address highlighted the future challenges that humankind would have to face, and urged the need to protect the natural resources to ensure livelihood security for the generations to come. "If we do not act now, we will all be in serious difficulty, he cautioned.

Reliable scientific basis essential:

Prof. M. G. K. Menon, Union Minister of State for Science and Technology, who inaugurated the symposium outlined the objectives of the International Geosphere and Biosphere Programme (IGBP) launched by the International Council of Scientific Unions (ICSU), and stressed the necessity to develop indigenous knowledge base.

"It is essential to have reliable scientific basis. It is an enormously difficult problem, and calls for a new approach and cooperation from the scientists. Such efforts should be supported nationally and internationally," he said.

Scientists have clear evidence on the implications of greenhouse effect, and on the depletion of ozone layer due to the emissions of dangerous gases. The change in the global temperatures and sealevels were not subject to national boundaries.

Serious and irreversible cataclysmic changes could result out of excessive human activities, and the world scientific community should come together to study and monitor the changes that were likely to take place, according to him.

Dr. A. P. Mitra, Director-General, CSIR (Council of Scientific and Industrial Research), presented an overview of the middle atmosphere chemistry, and highlighted the features of tropical atmosphere. He spelt out the ozone measurement statistics in the country, and said that certain new forms of chlorofluoro carbons were relatively safer than others.

Well away from precise understanding:

Dr. Anna Mani of the
Research Institute, Bangalore pr
ing a paper on "the earth's atm
radiation budget" pointed out
scientists were still far from
understanding of the general ba
energy on earth. There had been
nificant change in ozone level
India, she pointed out.

Dr. U.R. Rao, Chairman, Sp
Commission, described how the
sensing satellite imagery helped
suring the forest cover, degraded
and fisheries wealth. Satellite p
provide valuable information
resource base, and they can be used
preparing plans for sustainable m
agement of the natural resour
according to him.

Dr. Merher Homji, of the Fren
Institute, Pondicherry, dwelling on
relationship betwen the deforestati
and declining rainfall said that it
clear that the distribution and preci
tation was decided by the type of veg
ative pattern.

He described the role of forests
receptor and generator of rainfall.
South America, scientists have esta
lished that forests have the capacity
recycle rainfall by conserving rainw
ter and sending them back into atmo
phere through evapo-transpiration

Dr. T.N. Khoshoo, former secreta
to the department of Environment, N
Delhi, speaking on biological divers
and the need to protect biosphere s
that though the country had done w
in ex-situ conservation, very little ef
had been put in for in-situ conserva

He stressed the importance of bio
ical diversity, and pointed out how
'gene rich' developing countries c
provide valuable genetic materia
modern biotechnological research

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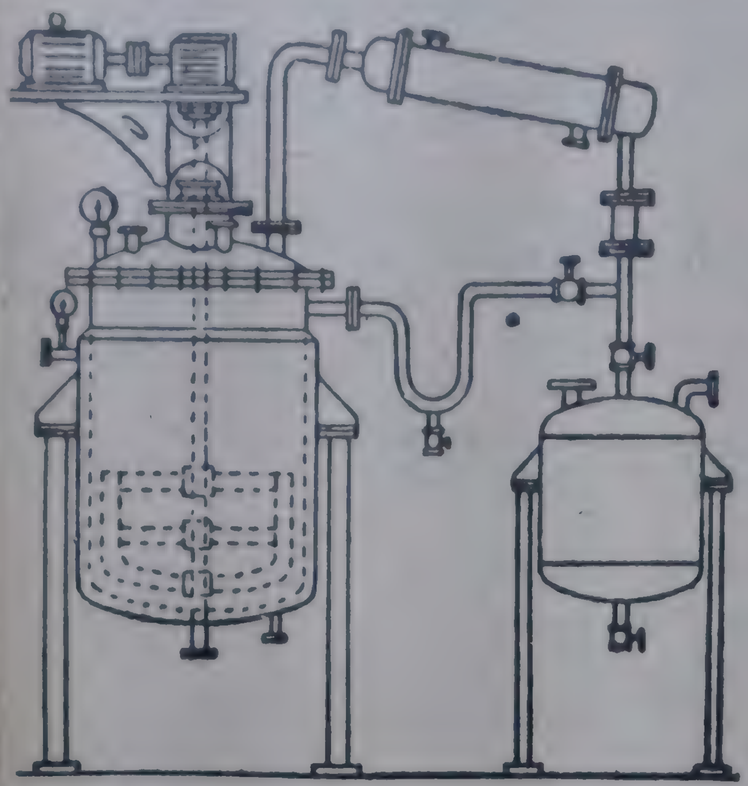

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ollution Control — Equipment, Planning and Training

Captain Robin B. Middleton, F.N.I., Brigs Marine Environmental Services Ltd.

written in six sections, highlighting the var-
ollution control legislation in different coun-
from the early oil spill disasters of the 1960's
aters. The progression since those days has
ntry to country and much of the planning has
e environmental issues and type of coastline
mination. The initial overview of the paper
nts as recent as the Piper Alpha tragedy in the
the requirement because of this incident for
vernment to alter its approach to oil spill clean

to 6 look at the options available to deal with
i.e. use of dispersants, the use of containment
systems, contingency planning and training
ing given descriptions of the equipment which
for dealing with oil spills, the importance of
ngency planning and training of the personnel
ith using oil spill contingency plans in the event
ies is highlighted.

l terms, awareness of the threat to the coastline
itain came to the fore in 1967 at the time of the
yon disaster off Lands' End. People became aware
t of large quantities of oil floating on the surface
as a pollution threat to the country's shorelines.
aries, bird and marine life can all be upset on a
rt-term basis and this whole environment is —
think of it — 'that small part of the world which
ok after'.

in, the Duke of Edinburgh perhaps came up with
ounded philosophy of this subject when he said
ot inherit this earth from our parents, we borrow
children". As members of an industry which deals
ction of hydrocarbons from sea areas and the safe
of these hydrocarbons onshore, we have a respon-
ensure that when it comes to resultant damage to
of the world' from these operations we
what we are talking about and
what to do in the event of an emergency

of Europe with the locations of major oil spillages
70s would show us concentrations of spillage in areas
shipping traffic. It is not surprising to find now that awareness is far more acute and ability to respond to spillage is better prepared in these spots than in other, more remote areas of Europe. The massive spillage caused by the Amoco Cadiz off the coast of Brittany caused a surge forward in manufacture of oil retention booms and recovery systems in France and such development is apparent in all the other countries where a similar impact has been suffered.

Many of the areas in which exploration drilling for oil is carried out may appear to be in remote locations. Government planners from time to time rest on their laurels, knowing that the computers and consultants have 'worked it all out' and how many times do we hear phrases like "it could never impact this coasts?" If 'it' is nice, clear, fresh oil, this may be true, but in 1987 we saw five miles of emulsified oil across the North Sea in seven days, breaking all records and beating any computer prediction so far.

The oil industry in Britain was quoted recently as having the most responsible attitude towards conservation and was named as the industry which works in closest liaison with environmental bodies. This may be because we are — or should I say because some companies and governments are — very aware of the environmental, financial and health consequence of major spillage and contamination of coastal sea areas, just as those people on the French and English coastlines of the English Channel are.

We will look in this paper at the possible sources of spillage and at the equipment available to deal with such spillage and try to link these factors up with contingency planning, a method of training people to deal with such a disaster and the requirement for good government legislation and policy.

Sources

We have already mentioned the Amoco Cadiz and Torrey Canyon and also in Ireland the explosion on the massive tanker Betelgeuse at Bantry Bay springs to mind immediately. Within the oil industry we have the capacity to cause serious pollution, whether it be by major blowout, during well testing and flaring periods, or through domestic spillage in inshore and sensitive areas.

The effect of oil and chemical pollution in the water column may well have a long-lasting effect on the marine ecosystem and food chain and this has become very apparent in recent months in British waters. The seal community suffered mass illness and death from a disease normally found in dogs, but able to pass through the seals' immune system which had

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esented at the Oil, Gas and Petrochemical Seminar, New Delhi,
989.

apparently broken down, possibly through a deterioration caused by toxic poisoning at sea. A large budget is being earmarked within the European countries to monitor, test and find out exactly what the extent of damage to the marine environment is to date. The effects of spillage and waste in sea areas must therefore be taken extremely seriously when it seems that the long term effect of such pollution can have a devastating effect not only in the marine food chain, but also on the health and well-being of the world's human population.

The most famous blow-outs so far have been in the North Sea (Ekofisk) and in the Gulf of Mexico (Ixtoc), and more recently of course there was limited pollution from Piper Alpha. There is another very famous well which has been spilling oil out for a long period of time and that is Norwuz in the Arabian Gulf. In this case, the damage to marine life and the terrible imbalance against nature has been forgotten in the face of prolonged warfare. The healing process in that area, after hostility does finish, could take 100 years before the long-term balance of nature allows present marine life to return to normal. Within the offshore oil industry, we must consider blow-out, pipeline fracture, catastrophic accident and intentional or accidental discharge and clearly understand the need for environmental protection and the method of cleaning up any pollution caused by our industry.

Legislation & Government policy

The legislation covering oil pollution at sea can be broken into three parts:

1. The Recruitments under a Marpol Convention accepted by those countries who are signatories.
2. Local government legislation concerning the prevention of oil pollution.
3. Monitoring of offshore discharges of hydrocarbons.

The other item of legislation concerning oil spill clean-up is the classification and construction of vessels suitable for recovery of oil.

Relationship with neighbouring countries

An example of friction caused by differing Government policy is highlighted in the relationship between the British Government and neighbouring Governments in Scandinavia about the use of dispersant in large quantities to deal with North Sea oil spills. British policy has for many years (since the days of Ekofisk) been to "leave oil alone because it will not land in any quantity after natural dispersion, water circulation and evaporation in the North Sea, or dispersion by aerial spraying".

The Norwegian Government does not allow the use of dispersant in coastal waters in any quantity and has opted for a positive clean-up and removal of oil and debris from the sea in the event of spillage. The two countries have grown apart in response tactics, both in economic and practical se

1. The British Government used their pollution clean-up budget to purchase stocks of dispersant and to charter aeroplanes.
2. UKOOA (United Kingdom Offshore Operators Association) Clean Seas Committee followed suit but adopted a shipboard dispersant spraying capability on a collective basis between the 30-odd participating oil companies. They in turn have made a major investment in dispersant stocks.
3. The Norwegian Government, however put the onus on the oil companies and local regions to set up oil spill clean-up response bases along the coastline, thus making alternative use of the equivalent UKOOA investment in dispersant, which costs about £1,000 per tonne and has a shelf life of about seven years.

During the recent Piper Alpha incident, the British response was to mobilise UKOOA stocks of dispersant as well as commercial stocks quickly available in Aberdeen and to have some 200 tonnes of dispersant on field and up to 350 tonnes available at Aberdeen. Midway through the operation, the Norwegian Government and the British Ministry of Agriculture, Fisheries and Food (MAFF) condemned the use of such vast quantities of dispersant because of the effect of sinking of oil and dispersant would have on the longterm marine ecosystem in the North Sea.

It may well be that such sensitivity would now be ten-fold after the recent incidence of illness in the seal community. At this point during Piper Alpha, the Government and Occidental Petroleum had to turn quickly to commercial companies to find out what, if anything, Britain could offer to physically collect and remove oil should this become necessary.

A response was available through the commercially run joint resources of Briggs Marine Oil Industry Call-out Club facility, Alba International in Aberdeen and the back-up of BOSCA British Oil Spill Control Association, which is a commercial body and part of the British Marine Equipment Council (BMEC). Several thousand metres of oceanic boom, as well as an oil collection capability of several hundred tonnes per hour, were found to be available to the company. This was in addition to one kilometre of boom and a 1 tonne per hour oil recovery already on field on board the pollution control vessel, MV Forth Explorer, and also a thre weir boom system capable of recovering 160 tonnes per hour of emulsified oil which was available from BP Petroleum Development.

Conclusion

Argument and hypothesis about the fate of spilled oil not help the environment into which the oil has been the simplistic but most simple response is just oil up anyway and argue about effects at a later il is recovered, the environment is safe from both effects of the spill and also from the prolonged about what it might do to the environment if dis- ft alone.

is dispersed, the bulk is reduced into droplets, sink into the water column. This is quite reas- vardly, because the oil is removed from the sur- ocean. If the water column is deep and healthily oil will degrade and disappear. However, if there ge enough area of subsea water column to bring natural dispersion, contamination on a longterm commence.

ople have said in the past that recovery of oil is on because of the weather restrictions at sea. This ds the negative and, throughout the 30-day period, Forth Explorer was recently on the Piper Alpha middle of the North Sea, she could have recov- though after the first few days, there was little to in the weather conditions prevailing on 24 of the ration. The negative thinkers would no doubt add ve could have been working in a monsoon..." If e positive about the matter, we must look to our e able to recover oil whenever possible and start from this point. The next part of this paper looks ons open to us.

t

ree options available to deal with any oil spill, i.e.
of dispersants
of containment and recovery systems
it alone to disperse naturally'

e the use of equipment and hence personnel trained of that equipment and able to operate it at a notice. This in turn produces an industry loosely pollution control industry' we shall look in this hese options and find out what is available to deal illage.

spraying

nt is a surfactant, or if you like, a surface active nmed to break down the surface tension which holds ss and to form droplets of oil which will fall into clumn to be devoured in a natural process. Early , unfortunately, added a great deal of toxicity to ng this breakdown period, but this has largely been hrough trial and experience, and those dispersants be used around the British Isles are now all tested ved by Warren Spring Laboratory and the Minis- iculture, Fisheries and Food. In early days, dilute were used in conjunction with breaker boards which were dragged behind the spraying vessel to assist in the breakup of the oily mass. This practice was cumbersome, back-breaking and extremely dangerous in all weather conditions and has, thankfully, been replaced by the use of more sophisticated mixing pumps, wide spray arms and concentrate dispersants of acceptable toxicity levels. Concentrate dispersants can also be used in aerial spraying, either from specially fitted out low-flying aircraft or helicopter spray pads.

When dispersants are used, it must be remembered that they are only really effective in light oils, freshly spilled oil and, therefore, effectively as a first line of defence against the spread of oil spillage. It is normal for approximately 60% of the light ends of oil to evaporate within the first 10 to 12 hours after a spillage and the effectiveness of dispersants becomes very much less thereafter, thus outweighing the consideration for continued use. It is also inadvisable to use dispersants where the water column, i.e. depth of water, is insufficient for droplets of oil to be effectively broken down by natural processes.

In summarising the use of dispersants, it is to be noted that the effect of modern, concentrate dispersants is extremely dramatic in reducing the amount of a mass of spilled oil and therefore highly commendable when it is possible to attack it at source in deep ocean locations. Dispersants may also be used (with due consideration to local fishery and seafood activities) in inshore areas to assist rough water tidal regimes to degrade oil, but never in areas of 20 metres or less or within one mile of such areas without prior consultation and advice from fishery or government bodies.

Many other chemicals have been produced in recent years, such as oil marshalling agents which can be used to advantage when attempting to protect or pre-empt the effects of impacted oil on coastal areas. The subject of dispersants and chemicals could be the content of an entire seminar and the author would suggest that for further informulation, members refer to the Institute of Petroleum's Second Edition Guidelines on the Use of Oil Dispersants.

Containment booms

There is on the market a vast range of oil spill containment booms, varying from the very largest (approximatel metre above and below the water) to the smallest ha boom which can be no more than a ship's rope floating on the water. Indeed, many African villages in coastal waters protect themselves with booms made by local village people from straw and other such vegetable matter. Straw in this manner can become extremely effective, as oil also sticks to it and can therefore produce a living, growing protection barrier. During the years since the Torrey Canyon, inventors have lived in a dream world, each one coming up with a boom or piece of equipment which they felt placed them in the position of chief guru in the pollution control industry. What most fail to grasp is that (a) every boom has its restrictions and (b) every boom is designed for a specific purpose.

Ocean booms

Considerations when selecting a boom for use in the open ocean are their flexibility and durability, aligned with one another's ability to stay afloat. The major ocean booms are normally air inflated (at low pressure) and available either in sections which are inflated individually during deployment, or in a continuous air and water tube supplying buoyancy and ballasting. The wave riding ability of the continuous tube is probably better than that of the sectional type, which is bound to have some degree of rigidity.

The expertise required, however, to maintain continuous inflatable boom is very much higher an obviously requiring a mother vessel of some description to maintain pumping. Manufacturers of the slightly more rigid booms may however point out that the loss of a little oil in the middle of the ocean as a result of this rigidity is not really going to worry anyone.

During the early days when such booms were used, we and many others attempted to form configurations such as the 'U' and 'J' shapes, dragging booms between ships. Such action is only effective at speeds of less than half a knot, and it soon became apparent that when dealing with oil on the ocean, the best approach was to surround a mass of oil with the boom and return the other end to the collection vessel, thus allowing the ship, boom and oil to float round the ocean at will. We then gently pull the boom towards the recovery vessel to ensure an ample supply of oil at the skimmer point. The motto of such an operation is that every tonne recovered is a tonne less to clean up ashore. Coastal booms tend to be a slightly more junior version of the large ocean booms and, in principle, are used in the same way to contain oil.

Harbour and inshore booms

In still waters, protected from weather, little need be said about the effectiveness of small harbour booms other than that they start with the ship's mooring rope and get progressively better (if not always easier to deploy). In areas outside a protected environment, the effectiveness of booms depends entirely on the expertise of the person deploying them as, in general, they will be totally ineffective against weather, sea and current. In the hands of a well-trained person, they can be anchored in such a way as to divert oil to the most suitable collection point and can also be used to stop oil exporting itself from a sheltered corner or area of a beach, estuary or port.

Oil sorbent booms

There are various makes of boom and other sorbent materials which will not only corral oil in calm water, but also absorb hydrocarbon materials and contain them within the boom's structure while rejecting any absorption of water.

Oil recovery equipment

Having corralled the oil spillage to a collection point, we must now turn our attention to separating the oil from the ocean and to do this, the inventors have designed pieces of equipment which will lift the oil into the recovery vessel and leave most of the ocean where it is. There are four main ways of doing this:

1. Floating suction heads.
2. Use of oleophilic surfaces.
3. Weir systems.
4. Sorbent materials.

1. Floating suction heads are normally part of a vacuum system and it can be assumed that recovery will be in the 40-60 ratio of oil and water.

2. Oleophilic surfaces, i.e. disc skimmers and rope mops. Oil sticks to these surfaces while water does not. The usual construction of such recovery systems is either disc skimmer or rope mop. Disk skimmers consist of banks of vertical discs which turn in the water and oil, picking up the oil but not the water. The oil is scraped off the disc into a sump within the skimmer head and then pumped to the recovery vessel. Oil rope/oil mop systems use the same principle, being made out of rope to which oil attaches, but water does not. The ropes interface with oil and water and then pass through roller systems which squeeze the oil again into a sump for pumping to the oil recovery vessel.

3. Weir systems are as suggested a skimmer head which is adjusted to accept floating oil into a pumping system. The latest advance cn this front is the Vikoma Weirboom Systems which incorporates a weir pumping system into an air and water boom and which pumps the oil collected along a third chamber into the collection vessel.

4. Sorbent materials are materials which absorb oil and retain it. The better of these materials can also reject water totally and hold up to 20 times their own weight of oil for weeks while remaining afloat. Materials such as this can be placed in interceptors, drainage areas and indeed in rivers and open waters. They are also used for clean up of lube oil which does not respond to dispersant.

Contingency planning

Contingency plans are of utmost importance both at national and local operational level. This is an area, however, where confusion reigns in many areas of Europe. I have found during periods of consultancy that up to four contingency plans exist for one little corner of Britain and that

ch one were unware of the existence of the
neans that unless plans are monitored by one
responsibilities of local agencies defined quite
ationship to each other and for instance the oil
ation of confusion can easily occur. The impor-
ng such a monitoring body also comes to light
nd language of such plans. A contingency plan
d by people under stress and must clearly tell
'what to do' and also why.

nt of the plan is something which must be con-
arefully and will vary to a certain extent, though
in format to meet the requirements of each situa-
portance of a single format is that the plan must
n where to get help and what is available to them,
son if trained in this field of work should rec-
rmat of the plan and be able to turn to the rel-
with ease rather than as a matter of search and
son dealing with the plan must be someone who
ng in this type of response and also knows some-
he options available for dealing with spilled oil.
us to the subject of training.

ining

ersonnel, means educating and teaching them

er which will put into action the proper chain

he duty person must have an understanding of
pill Contingency Plan
erson must be able to assess the requirements
ation

past six years, we have as a company, trained
ed people both in the practical aspects of pollu-
and more and more in recent years in the phi-
nd response and contingency planning. It is very
important to teach people to mobilise equipment for which they are responsible, but it does not serve much purpose if a person uses an ocean boom once in training and then tries to deploy the same boom from memory two years later.

Our training in the use of equipment is pointed more at evaluation and knowledge of the time and difficulty involved in deploying a certain item. This also assists in budgeting and planning when selection of equipment is made. It is important that the person making such selection is aware of the limitations of the equipment. Contingency planning and response management are the factors which we feel are very important. The laws, the relationships betwen the four people mentioned earlier, each with their own contingency plan are the basis for policy, budget and manning.

It is very much easier for the Consultant or Operations Superintendent of a response company to deal with people who understand what is the best way of dealing with a situation, people who realise that their actions will be scrutinised by underwriters, government ministers, legal departments and most importantly, the press and public at large. We have found that the best coverage for such training can be achieved through seminars both offshore on installations (where the spillage and reporting procedures may begin) and following the path of the spill through shore operations and senior management to government level.

The other effective training course is the team method of approaching an area scenario, planning, budgeting, writing a contingency plan and then testing to destruction the resultant response. To close with, we should define the difference between crisis management and management of crisis. Trained personnel with the correct knowledge, philosophy and equipment will manage a crisis. We all know and have probably experienced crisis management. There should be no doubt what we aim for within our own framework of responsibility.

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Sensory evaluation: matters of taste

Dr. HAL MACFIE
Department of Food Acceptability, UK Agricultural and Food Research Council,
Institute of Food Research, Reading Laboratory

Essential to any investigation of the eating quality of foods and the design of new food products is the effective measurement of sensory properties such as appearance, texture, aroma, flavour and taste. The process by which panels of people are used as instruments for this task is known as sensory evaluation. Recent advances in sensory methodology have greatly enhanced the quality and broadened the scope of information that can be extracted from such laboratory panels. Research effort is now aimed at relating sensory properties measured in this way to acceptability as assessed by consumers, taking into account individual preferences.

In the study of the properties of foods it is very important to distinguish between their physical and chemical properties, their sensory qualities, and their acceptability. Physical and chemical properties are measured by instruments that in no way mimic the eating process, so the data do not necessarily relate to the eating quality: that is measured by a sensory panel, made up of people selected for their sensory acuity and ability to articulate the sensations they experience while viewing, smelling and eating or drinking the food. They are not usually asked to say how much they like a particular product, for preference scores by a few individuals who have been asked to dissect their sensory perceptions are not likely to represent the population view. Preference or acceptability is assessed by consumers in tests at home or in halls where preparation and lighting conditions can be more closely controlled.

Once these distinctions have been made, it is obvious that an important aim of food research must be to see how far liking of a product by consumers can be explained in terms of its sensory qualities and how well the sensory qualities can be explained in terms of the physical and chemical properties.

One problem with sensory evaluation, as distinct from other scientific disciplines in food research, is that the human being is an extremely complex measuring instrument, subject to a great deal of environmental variation and noise. The level of measurement achieved is sometimes no more than rankings or sample classification of samples into groups, while on other occasions very detailed descriptions and quantifications can be produced. For this reason certain new statistical approaches have been derived for the analysis and presentation of sensory evaluation data and for relating the data to the other aspects.

Sensory panels perform three main tasks:
ination, recognition and description. In a discrim
the assessor may have to select the odd sample
where two are the same. This is known as a
a recognition task the assessor may be asked
whether a particular property is present or not.
generates a great deal of data. However, in a
the assessor may score a product for the
10 attributes for each of the general sensory
of appearance, texture, flavour and taste. In a typ
session each assessor may evaluate four to six
there may be four such sessions in a morning. Sen
sory units now tend to employ professional pan
of members of staff, and with a typical sensory
people it can be seen that a morning session produc
of 12,000 numbers. Multiply that by three to
of a typical week's work, and it becomes easy to
why most sensory units are now installing personal
in each sensory booth.

Our Institute has developed its own software to
from category scoring, line scoring (in which ass
points on a line which has end labels equivalent
extreme) or free choice profiling (described later
on a network of BBC microcomputers. The softwa
marketed by Reading Scientific Services and is
able on IBM PCs.

Analysing sensory data poses special problems
address with a software package called SENPAK
for use in the sensory laboratory. With this, the
first investigates the performances of the asses
sors by calculating their discrimination and comp
scores with those of the rest of the panel. Wh
are found to be inconsistent, it means they are
torting the panel data, so their individual data
the analysis. The package then calculates panel
submits them to a multivariate statistic
duces maps of the samples and the
among the descriptors, as shown in the
to tomato soup. SENPAK is widely used
and is available in BASIC and PASCAL
guages.

Free choice profiling

Descriptive profiling uses a fixed set of
scribe a product. They are usually selected
during time consuming training

ndividual panellists use different
same sensations. Examples of such
ale' and 'sour'.

as been developed within the Agri-
ch Council as an elegant and novel
f confusion over the meanings of
pportunity to shorten training ses-
em altogether. Using this system,
er allocates scores for all samples
ual profile. The profiles are then
raged using a complex mathemat-
ped within the AFRC, called Gen-
sis (GPA). Its basic rationale is that
larities among the samples do not
panel, it can be assumed that the
he same sensory properties regard-
em. The inter-relations among the
arious individuals are revealed by
h they have with principal dimen-
mples configuration produced by

s already been successfully applied
cts including porks, coffee, proces-
irradiated turkey, as well as to the

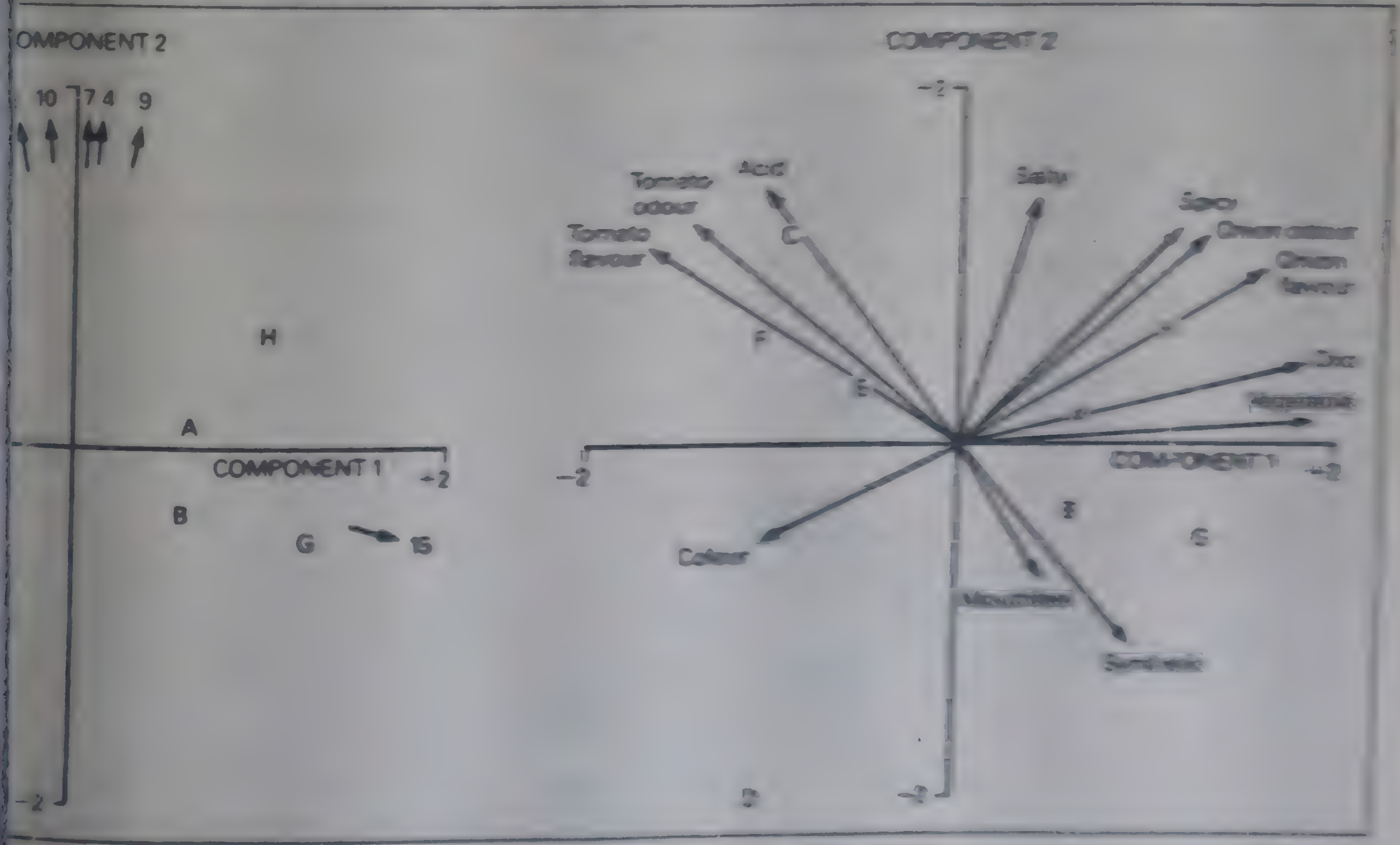
aroma of seafood and the texture of hamburgers. It is well suited to trials of food that has been stored, when it is usually impossible to have a fixed profile beforehand; moreover, it helps overcome the fact that panellists and consumers vary a great deal in the way they describe flavour and odours that develop with storage.

While the food and food-related industries have shown considerable interest in the technique of free choice profiling, a serious impediment to its wider use is the big demand that the Generalised Procrustes method places on computer resources. We have derived a novel algorithm that cuts analysis time by a factor of 1000, and there is now a program written for IBM PC compatible microprocessors that is available commercially.

Meat products

A common error that research workers, product developers and market researchers are prone to make is to assume that a word used in a sensory context, such as 'fatness', is a sensory indicator of a physical constituent such as the fat content of a particular product. In the case of manufactured meat products this is often quite wrong. Careful and detailed correlation analysis is needed of large sets of physical and chemical measurements on the one hand and, on the other, sensory descriptors sampled from a broad range of products

om a principal components analysis of a sensory profile, from trained panellists, of eight commercial packet tomato
d similarly are grouped together and show differentiation between ratings of tomato flavour, other flavours, colour
ence vectors for 15 individual panellists superimposed on the sensory space from the diagram on the left. Moving
or represents increasing liking for the samples by that individual. Most of the panellists preferred samples C, F
ato flavour, but three preferred sample D, which had less flavour but much more colour.



Even then the relations may be only associative and not causal.

The approach derived at our Institute is to extract the main factors of the sensory space, shown by a diagram, and plot the correlated structure of the physical and chemical measurements on this factor space. In a recent study on ham, this graphically revealed the different parts played by total water content and bound water content, as depicted in the photograph.

Relating to consumer preference

Establishing the relationship between eating quality and consumer preference data calls for a model that permits different preference patterns to be detected and incorporated into it. Simple averaging of preference data when there are two opposing views of preference cancels out any significant result. Our Institute has encouraged the use of preference mapping for this task. There are two types of preference mapping, known as internal and external.

Internal preference mapping resolves a series of consumer scores on a given set of samples into a set of preference dimensions that represent the differences among the individual samples, and a set of vectors (one for each consumer) that shows the individual directions of increasing preference. This model is favoured by market-led organisations, and the correlations of sensory attributes given by laboratory panels can be superimposed on to this space.

The power of the technique is shown by a recent study that examined sources of variation in restructured steaks. Internal preference mapping indicated variation in fat and salt content to be the most important determinants of acceptability. However, consumers varied widely in individual preference, so conventional analysis of the a
bility scores showed no significant differe
different formulations tested.

External preference mapping uses mat
ques known as linear or quadratic regres
take account of the ordinal nature of the p
to express the scores of each consumer in
sory dimensions defined by the laboratory
model is favoured by scientists and food s
believe the sensory (or instrumental) space g
ingful representation than that obtained f
sumer preferences.

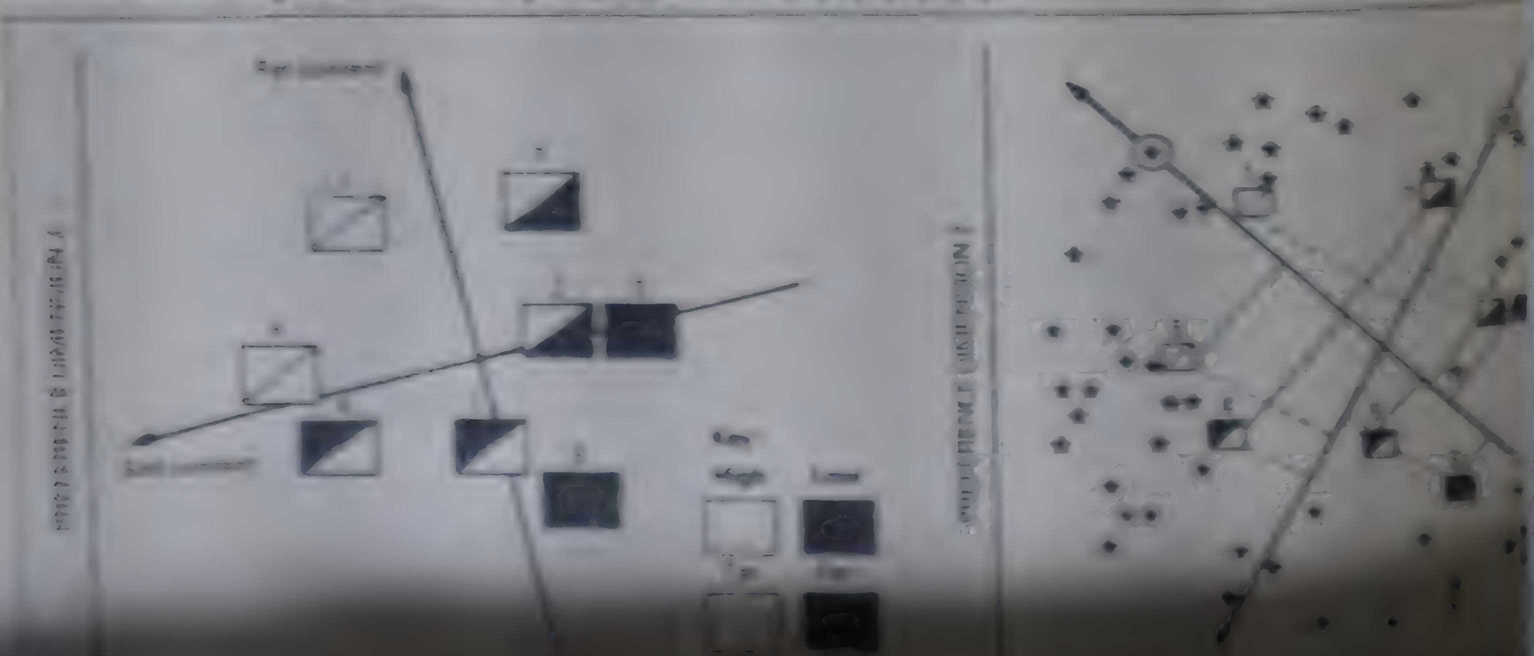
In a recent collaborative study with th
of Higher Education, external preference
that consumers divided into two opposing
preferred fresh chicken, the other pref
chicken. Another small scale exercise m
panellists based acceptability on flavour b

The commercial importance of preferen
not just from the amount of information i
mentation of opinion, but also because it pr
Algorithms are written in the GENSTAT
guage and an IBM PC version is now b

Where next

Computer science will continue to chang
sory evaluation is carried out. Continuou
sations throughout mastication, or of aft
after swallowing, known as time-intensit
one probable development. Computer log
ical activity in the mouth or even in the b
may also hold the key to explaining indiv

Left: Preference map for eight restructured steaks. Right: Here, each star represents scores for one consumer, from whi
erence can be deduced. For the consumer indicated by a star within a circle, the order of preference is products 1 & 7
consumer indicated by a star within a square, the order is 7, 3, 2, 1, 5, 6, 8, 4.



…space illustration of the sensory variation in [illegible]. Sensory descriptions are indicated in lowercase lettering. Directions of variation of the physical and chemical measurements are …tors annotated in capital letters. The variation in total and in bound water content appears to be independent.

…at we need to understand
…behaviour accurately but to

…ds are only one of many fac-
…research is needed to develop
…n into a coherent framework
…y a person selects one food
…elucidate the part that visual
…, gloss, surface texture and
…ality.

…sensory trials, there is a need
…to be done on the factory
…small differences that might
…conditions. Techniques for
…trials are required. Another
…is the development of sen-
…can be used for sequential
…products by retailers, gov-

ernment organisations and even by the consumers themselves. Ways to speed up the optimisation of manufactured products are in continuous demand.

At the strategic level there is still a great deal of research to be done on the basic mechanisms of sensory perception. Particular areas of interest to our Institute are the perception of flavour, its masking and its enhancement. In the UK there is a general initiative to understand more about the mastication process and thereby be able to define perceived texture more accurately.

This is an exciting and multidisciplinary area demanding the skills of psychologists, mathematicians, food scientists and flavour chemists, to name but a few. With the creation of a Department of Food Acceptability at our Institute we are now building such a team and hope to make a unique contribution to the understanding of what makes people like some foods and not others.

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Chemical News from Abroad

ENIMONT FIRMS UP SWAPS WITH SNIA AND ORKEM

Enimont and Snia have detailed the terms of their asset swap agreement in the fibres sectors, involving the exchange of six plants. The two companies first signed a letter of intent for the exchange in March 1988.

The total value of the asset swap in terms of turnover amounts to L250bn ($194.7m). As the exchange is on an equal value basis, no cash payments will be made.

Under the terms of the agreement, Snia will give Enimont its acrylic fibres and polyester fibres assets. These comprise acrylic fibres assets at Villa Cidro and Cesano Maderno, with sales of L180bn, and polyester fibres assets at Naples, with sales of L70bn.

In return, Enimont will give Snia its polyamide fibres assets at Pisticci, with sales of L130bn, its cellulose acetate assets at Vercelli, with sales of L40bn, and its nylon and polyester film and other treatment products activities at Fara and Umbria, with sales of L80bn.

This rationalisation step in the Italian fibres sector enables both companies to strengthen their respective leaderships. For Enimont, the world's leading acrylic fibres producer, the exchange will increase its share of the European acrylic fibres market from 31 to 38% and in the polyester fibres market from 13 to 14%. Fibres already account for 9.1% of Enimont's overall sales, and contribute about 6.1% to its overall gross profits.

Snia, on the other hand, will see its share of the European market climb to 50 per cent from 24 per cent currently in nylon cast film, to 75 per cent up from 56 per cent in biaxial nylon film and to 30 per cent up from 16 per cent in polyamide [illegible] for textile [illegible] In acetate yarn from cellulose, where Snia operates with Courtaulds, its market share increases to 50 per cent from 36 per cent.

Meanwhile, despite the restructuring in the French state-owned chemicals industry, Enimont and Orkem have firmed up their asset swap arrangement covering polyethylene/polymethylmethacrylate operations. The contract came into effect on 1 January 1989.

Under the agreement, Enimont has acquired Orkem's low density and linear low density PE production, totalling some 380,000 ton/year and 100,000 ton/year, respectively. In return, Enimont has given Vedril, the company encompassing all its methyl methacrylate activities, to Orkem. Vedril produces 60,000 ton/year methyl methacrylate and 40,000 ton/year polymers at units in Germany and Italy and has a turnover of around FF900m/year ($152m).

In addition, a joint venture between the two partners is to operate Orkem's 820,000 ton/year Dunkirk cracker, ensuring feedstock for all plant on site, including the PE production transferred to Enimont and the Beaulieu PP installation.

Enimont is setting up a new company in France for the PE production, Societe Francaise de Polyethylene. The new company will take in all R&D, production and sales activity related to the product.

ABB COMPLETES CE PURCHASE

European engineering group Asea Brown Boveri (ABB) has completed its agreed acquisition of US group Combustion Engineering (CE), for $1.6bn, having purchased to date around 96.7 per cent of the shares currently issued. The acquisition includes CE's petrochemical engineering subsidiary Lummus Crest. "It is very important for ABB to be in the US market, where it
has never been befo
spokesman said. The ac
the US the biggest singl
ABB structure, follow
Germany, he added.

Although the US jus
said it would not block
its antitrust division is s
the possible anticompe
acquisition could have a
for air pollution contr

EC APPROVES OR

The EC commissio
approval to the FF9.5b
the French state m
between 1985 and 198
turing. Originally the
disputed the grant, eq
subsidy, while the Fre
maintained it was pla
role of a shareholder.

Pointing to the con
which it has made in
overcome its handica
announced that in 19
some FF3bn profit on
In comparison to 198
stable profits on sale

Meanwhile, after
bid for UK's Croda
holds 94.9 per cent o
facturer's shares, ac
Orkem, which owned
had launched a bid
October 1988.

ICL SELL-OFF HI

Israel's Knesset
has rejected the min
plan for the sale of
(ICL) by a vote of 7
government to rever
decision to sell a c
ICL to a foreign inv

Instead, the
[illegible]
[illegible]

Tel Aviv

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Pharma will
of covering
a company
ycomed has
Schering in
es, he added.
he licensing
y and finan-
arma has the
rk in Austria
and routes to

range is complementary to Nycomed's strength in diagnostics. It also has promising new products in the antirheumatic and cardiovascular sectors, which will enable Nycomed to achieve its aim of having another side to its pharmaceutical range besides imaging, the spokesman said.

CL Pharma had a turnover of Sch. 2bn and pre-tax profits of Sch. 14m in 1988.

EC AGREES ON CROSS-BORDER MERGER REGULATIONS

Community-wide regulations on cross-border merger controls, which may lead to significant restructuring of companies within the EC, have finally been adopted by the internal market council. The agreement comes after more than 15 years of discussions.

Under the regulation, a merger will be vetted by the commission if the combined turnover of the companies concerned is over Ecu 5bn ($5.89bn) and the total turnover attained individually within the EC by at least two of the companies concerned is over Ecu 250m, unless each company obtains not more than two thirds of its total turnover in the EC within one member state. Around 40-50 mergers are expected to fall into this area each year.

The Ecu 5bn threshold had been a main stumbling block for the agreement as member states had wanted thresholds varying from Ecu 1-10bn depending on the level of antitrust regulations already in force in the country. In order to suit smaller countries, a member state may still ask the commission to intervene if it has reason to believe free competition in its own territory would be threatened by the move.

After a final discussion, it was decided that national antitrust authorities would not be able to finalise a merger after it had been approved by the commission unless it was [illegible] [illegible] tified market, such as in the fields of national security, media ownership and prudential rules for financial service, a spokesman from DGIV, the competition directorate said.

The regulation is scheduled to come in force in September 1990, but the four year transition period began on the date it was adopted, i.e. 21 December 1989. Companies are required to give prior notification of mergers covered by the controls not longer than a week after signing a protocol agreement. The commission must formally give its approval within three weeks of the notification, or within three months if it decides there is doubt about its compatibility with the common market.

SB CONTINUES DIVESTMENT TRAIL

Smithkline Beecham (SB), the UK/US drugs giant, has continued the divestment of peripheral businesses with agreements to sell its worldwide UHU Adhesives business and its household products operations in the US and Canada. The move reflects the company's strategy, announced when the merger was formed in 1988, of focusing on the development of its international health-care business.

UHU Adhesives is to be sold for DM269m ($155m) to a West German consortium, HSG, comprising two industrial investors and Citicorp Venture Capital, together with the present management of UHU. Some DM250m of the purchase price will be paid in cash and the remainder by vendor notes maturing over the next seven years.

UHU, which had a turnover of £43m ($69.3m) in the year ended 31 March 1989, manufactures and markets a wide range of household adhesives sold in 50 countries worldwide. It was acquired by Beecham in 1970. The household products business is to be sold to West Germany's Benckiser for a total consideration of [illegible] principal products include fabric softeners, detergents and bath additives. Most of the products were acquired in 1977 from Merck and Co. In the year ended 31 March 1989, the business reported sales of $76.6m in North America. SB also intended to sell its cosmetics business as part of its divestment strategy. It had originally intended to sell it as one entity, but is currently in negotiation to sell the UK and European businesses separately, a spokesman said. These businesses have sales of around £240m/year and £160m/year, respectively. According to observers, the sale of this division may raise £400 m.

PETROFINA SEEKS TIE WITH IPA

Belgian Oil group Petrofina has launched a friendly takeover bid, through its paints subsidiary Sigma Coatings, for France's Industrie des Peintures Associees (IPA). The total offer is valued at round FF318m ($55m). IPA, the fourth largest paints producer in France and the last independent one, manufactures and sells its products under the Gauthier and Novemail trade names and posted sales of FF700m in 1988. Sigma is the seventh largest paints producer in Europe and third worldwide in marine paints. Together, Sigma and IPA will produce 200,000 ton/year of paints and post sales of FF3.9m/year, ranking ninth in the world. According to Petrofina, the two companies are "strongly complementary" from a technological, manufacturing and commercial point of view, both internationally and in France.

SANDOZ/SCHERING LINK AGRO UNITS

Responding to the tough agrochemicals business climate, Sandoz and Schering are discussing a possible merger of their respective agrochemical efforts. A 50:50 joint venture company would be a top ten player in the market with sales topping $
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uary and is expected to remain down for a month. Fina has also planned a 45 day shutdown of its 272,000 ton/year plant at Coumar. Observers are saying they would not be surprised to see numbers go even higher in the coming weeks.

In Europe the failure of expected start-ups led to the upswing in price ideas. Although operational Atochem's Gonfreville unit was operating below capacity, while Shell's 300,000 ton/year Moerdijk unit is also thought to have suffered maintenance problems. Several producers are said to have entered the market as buyers, so boosting prices.

Shell Canada's difficulty in meeting its contract negotiations has added a new dimension to styrene. Shell Canada is traditionally a major supplier to the Far East, so if it is unable to meet obligations then potential opportunities will arise. Buyers in Taiwan and Korea have shown reluctance to pay the numbers quoted by European sellers. This could change if derivative producers wish to secure material.

Q1 CONTRACT SETTLEMENTS REACHED

The first batch of quarter one contracts are now beginning to filter through. Players are known to have wished to settle a larger number contracts before the break, however this was not possible.

Benzene has been concluded at DM660/ton for the first quarter, although this represents no change in DM, a weaker dollar makes this a significant increase in the dollar price. Although players appear generally happy with the agreement, it appears that a higher number may have been achieved if spot benzene had not fallen away so drastically at the end of year.

Exxon is believed to have been the market leader in settling the first quarter contracts, with others following. US January contracts have been concluded at $1.35/gallon, again Exxon is said to have led the field.

Toluene's TDI grade contract is now settled for quarter one. A figure of DM505/ton was agreed between Bayer and Deutsche Shell. The contract represents a fall of DM10/ton and reflects the current sluggish nature of the toluene market.

Orthoxylene players have finalised contract deals at DM515/ton for the first quarter. The new contract figure shows a loss of DM135/ton on last quarter's agreement. Observers say that the lower first quarter contract is not just a comment on the lacklustre orthoxylene market, but reflects the total malaise afflicting the phthalic anhydride market.

Although the slump in the phthalic anhydride market has been more demand-led than price-led, it is hoped that the lower feedstock prices will help the downstream products stage a recovery. UKW of West Germany is believed to have been the market leader in agreeing a first quarter contract of DM310/ton for methanol. The contract represents a DM50-60/ton rise on fourth quarter numbers. It is generally believed that the new price reflects the recent buoyancy of the methanol market. A number of supply problems has seen the methanol market turnaround in last few months.

US ETHYLENE OXIDE REMAINS STABLE

North American ethylene oxide consumption grew at 5 per cent in 1989, according to Colin A Houston & Associates (CAHA), New York. Demand for ethylene oxide reached 771 000 ton/year last year. While in the US, domestic demand for ethylene oxide derivatives grew at 2 per cent for the same period.

According to the consultant the US ethylene oxide market is suffering numerous structural changes, triggered by strong world demand for ethylene glycol.

Although the glycol market is set to weaken in 1990, a quick rebound is expected. Exports from the US look set to remain strong. A recent period of tightness saw ethoxylates either reduce capacities or even stop the manufacturing of some products, due to the lack of ethylene oxide. In the short-term the market has returned to balance and few shutdowns are noted.

In the long-term ethoxylators are concerned about securing regular supplies of ethylene oxide. Producers are looking at exclusive joint ventures or relocations nearer ethylene oxide producers.

Texaco and Union Carbide have announced their intention to withdraw from the ethylene oxide merchant market, thereby removing two valuable suppliers. The companies plan to increase their own internal production of fibre grade glycol, intended mainly for the export market. Output in other derivatives such as ethanolamines, surfactants and other derivatives, will also rise.

An agreement between Texaco and Ethyl has altered the balance in the alcohol ethoxylate market. Texaco's level of integration now rivals Shell's. Hoechst, Shell, Texaco and Union Carbide have added some 195 000 ton/year of new capacity in the last year. A further 344 000 ton/year of additional US product plus 299 000 ton/year of Canadian material is expected before 1993. In spite of the large increase in availability, operating rates should remain above 90 per cent to 1995.

Strong demand for PET resins and ethanolamines is being offset by altering demand for antifreeze. Net exports of fibre glycol will grow at over 4 per cent throughout the 1990s. [illegible] [illegible] for the largest share of the [illegible]

ylene oxide merchant market. Ethylene oxide is also used in urethane polyols, flame retardants, choline chloride and ethoxylated starch.

The glycol ether market is experiencing substitution with propylene glycol displacing some ethylene glycol, as concern for the toxicity of the product grows. Approximately 80 per cent of glycol ethers are ethylene based. This is expected to decline to 65 per cent in 1995. Ethylene oxide is also being substituted for propylene oxide, as far as is technically feasible.

COLD HITS *US* ETHYLENE; NWE CONTRACTS EMERGE

Virtually all the ethylene plants in the US Gulf are closed due to harsh weather conditions. The extreme cold has disabled the heart of the US cracker industry. It has been estimated that up to 300,000 tons of ethylene production has already been lost.

The shutdown does not appear to have had a great effect on prices, as derivative units have also been brought down. With producers' inventories still relatively high, producers do not appear to be overly concerned.

US producers are believed to have curtailed their export activities for the present time, although European suppliers are expected to temporarily fill this gap, despite the number of cracker difficulties experienced at the end of quarter four.

Although no first quarter contracts have been settled, initial nominal numbers appear to be emerging. One major buyer is already believed to have rejected a figure of DM860/ton FD for quarter one. Buyers are thought to be looking at a nominal range of DM830-850/ton FD.

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Brazil's acute shortage of fuel has focused attention on methanol, especially imported product. A poor sugar crop, coupled with strong demand from other sectors, has left Brazil short of ethanol, which is used extensively as vehicle gasoline.

GROWTH IN SPAIN

Spain's chemical industry achieved a 9 per cent increase in production with a 9.5 per cent increase in consumption in 1988, according to figures released by the Spanish Ministry of Industry and Energy. Capacity utilization increased to 91.5 per cent compared with 87 per cent in 1987.

The greatest production increases were achieved by the pharmaceuticals and plastics sectors, each of which saw a 12.9 per cent rise. In the plastics sector however, rubber was weaker in terms of production and demand, despite synthetic rubber exports reaching record levels.

Exports of SBR and PB rose by 147 per cent over the 1987 level to reach 36,300 ton, offsetting a large decline in domestic demand and increasing imports. Domestic SBR and PB consumption dropped 10 per cent to 98,500 ton. However, imports grew by 12 per cent to reach 72,800 ton.

Total domestic rubber demand fell 3.9 per cent to 240,500 ton in 1988, with demand for all grades of synthetic rubber falling 8 per cent to 138,300 ton, natural rubber demand increased 2.9 per cent to 102,200 ton.

Total rubber imports increased 5.5 per cent over 1987 to reach 217,100 ton with the major proportion being synthetic rubber up 7 per cent at 113,500 ton while natural rubber imports rose 3.8 per cent to 103,600 ton.

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Environment

UK UNVEILS FRAMEWORK FOR ENVIRONMENTAL PROTECTION

The UK's long-awaited environmental protection, or "green" bill was announced by the government just days before the Christmas recess. The weighty document contains the widest ranging environmental legislation ever seen in the UK and arguably the most stringent in the world. It introduces to the UK the concept of integrated pollution control, which will apply to all processes which have scheduled air emissions, discharge "red list" substances or produced significant quantities of special waste.

The approach will use standards derived from BATNEEC (Best Available Technology Not Entailing Excessive Cost) to reduce waste generation and to control the effect on the environment. All environmental quality objectives will have to be met.

The approach will apply immediately to new plant and be applied over a period of time to existing installations. An authorization will be required which will be open to public scrutiny, with registers giving details of the operation and whether standards are being met. The UK's Chemical Industries Association has described the broad objectives of the approach as "laudable".

"They are entirely consistent with the commitment of the chemical industry, as set out in its Responsible Care Programme, to improve performance in key areas of public concern" it says.

The bill also reforms current waste disposal law, conferring enhanced responsibility on waste producers, and tightens controls on the importation and exportation of toxic waste and use of genetically engineering organism. There are also measures to prevent dumping at sea outside the UK's territorial waters. Penalties for incineration at sea without a licence rise from £2,000 ($3,226) to a maximum of £50,000.

Welcoming the bill in principle, John Cox, director general of the UK's Chemical Industries Association, said it "set out to make a positive and effective contribution to environmental protection and improvement." Association executives are now examining the fine print of the bill, before giving a detailed response.

The CIA says it had become increasingly concerned that the present fragmented system of controls in the UK was not sufficiently responsive to current needs and has for some years urged the government to make improvements in the areas of policy development and enforcement of legislation.

GERMAN MAJORS FORM RECYCLING JV

West Germany's three major plastics producers, BASF, Hoechst and Bayer are collaborating in a joint venture plastics waste separation and recycling operation. According to BASF the operation will be capable of handling some 15,000 ton/year of waste and will cost some DM50m ($30m).

The three companies intend to set up a demonstration plant in a large German city, to be operational later this year. This will process a full range of domestic waste, separating out plastics recycling these into usable form and ultimately incinerating material at the end of its useful life.

The move is seen as a response to forthcoming EC legislation on waste and especially the plastics component. The proposed Directive is known to favour recycling and, it is thought, will set targets for a minimal amount of disposal by incineration, around 15-20 per cent. Incineration is the method so far favoured by plastics industry bodies such as the UK's BPF, Germany's VKE and Europe's APME. These point to the high thermal value of plastics waste

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An alignment for vehicles of larger capacities along the norms and by the dates set out in Directive EEC/89/458 based on an improved European trial procedure designed to reflect typical driving conditions:

The incorporation into this procedure of emission values already fixed by the Council for small cylinder cars so that Europeans are as strict as those in the US:

To agree on norms to be applied uniformly to all capacities and to both gasoline and diesel engines. Norms for diesel engines which are stricter on particle emissions than Directive EEC/88/436 sets out: and

The introduction, in accordance with Commission promises made in June 1985, of supplementary requirements on the durability of monitoring devices.

HOECHST AWAITS BURNER RULING

Following a six-day public hearing, Hoechst is now awaiting a decision by the Hesse state authorities on its plans to build a new 60,000 ton/year toxic waste incineration facility at Frankfurt. The district administrator's office has hinted this is unlikely to come before 1990.

Under West German emission control statutes, the authorities were required to hear complaints filed by 2,500 residents living close to the planned facility. Opponents say they will file suit against any state decision in favour of the plant.

As this could force a delay, even if only temporarily, Hoechst does not now expect the new facility to be completed on schedule in 1991. The company has therefore said it will consider applying for permission to continue to operate an existing 40-45,000 ton/year incinerator beyond the 1990 cut-off date.

The new plant is set to be built at a cost of DM135m. ($73m) by MAN Gutehoffnungshutte, using rotary furnace technology and wet scrubbing. Hoechst proposes to burn 59,000 ton/year of production residues from its Frankfurt complex, 30,000 ton/year of wastes from other plants in the Rhine-Main area, and 3,200 ton/year of residues from plants at other West German locations. Incineration will produce 8,000 ton/year of salt residues, which Hoechst plans to discharge into the river Main.

CEFIC RESPONDS TO MOUNTING PVC LOBBY

In response to the mounting environmental lobby against chlorine and chlorine-containing compounds, Cefic, the European federation of chemical industries associations, is setting up a policy group to address the problem for the long-term. Manufacturers and users will be involved.

Cefic is concerned about what is sees as "emotional reaction": some 55-60 per cent of the chemical industry would grind to a halt if chlorine and chlorine containing compounds were restricted, a spokesman claimed recently.

The new group will study the ecological effects of chlorinated compounds, assess the hazards and evaluate the risks. It will look at risk management and the possible restriction or withdrawal of some compounds from certain uses. Other actions by the group could include an outreach-type programme providing information to the public.

Cefic envisages future restrictions on the marketing of certain products containing chlorine. But consumer action, it believes, will be more forceful than regulation. On PVC bottles, the target of many environmentalists, Cefic believes the answer lies in waste management.

News from America

SHELL FORESEES OVERCAPACITY IN EUROPEAN ETHYLENE

Shell International Chemical sees signs of impending ethylene overcapacity in Europe. According to a Shell spokesman capacity creep provides the potential for an extra 4%, 5% of capacity in other words on extra 2 million m.t./year of ethylene by 1989. The company fears operating rates could fall to 85% in the early 1990s.

For the first time since March 1986, production of ethylene in Europe has been substantially lower than available capacity. In September last, ethylene production was at 13.6 million m.t./year against available capacity of 14.3 million m.t./year.

Technical limits are slightly above 15.5 million m.t./year, a figure reached when ethylene capacity peaked at this level in February 1989.

Since then, several units that had been closed for maintenance were re-started. The result is significant creep that has boosted available capacity in Europe to 15.2 million m.t./year.

De-bottlenecking potential is sufficient to cope with demand. Shell is considering major debottlenecking at its Mossmorran, U.K., ethylene plant — a joint venture with Exxon — and is studying plans for a new unit at its Moerdijk site in the Netherlands, although this now looks doubtful.

ICI has found it non-feasible to reopen its ethylene unit at its Wilton site. Dow-Europe has postponed plans for a cracker at Terneuzen, the Netherlands. However, new crackers will be built by En-Mont at Brindisi, Italy and by West Germany's Veba. BP Chemicals on track with a huge expansion at Grangemouth, U.K. and Repsol is proposing a new grass-roots unit in Spain. BASF announced in September, its firm plans to go ahead with a brand new ethylene plant at Antwerp, the prime motive for building the new plant is to secure a captive propylene supply.

As regards polyethylene, Shell claims PE demand in continental Europe is booming.

Stocks which peaked in spring 1989 at 470,000 m.t./month, were back down to about 350,000 m.t. in September and margins have turned up.

In polypropylene inventories of about 500,000 m.t/month are twice what they should be, and production curves are climbing steeply, despite efforts by producers to keep output in check. Himont, the largest producer, was running at 50% capacity.

Shell's PP demand growth projections are quite optimistic, at about 10%/year. Because of its strong feedstock backup, Shell is able to maintain a large position in the commodity grades of polypropylene. However the company is in for a 50/50 split between commodity and specialty polymer grades for the future.

The impact of a decline in prices for polyethylene and polypropylene has been clearly seen in Shell's third-quarter results.

Chemical earnings fell dramatically to $308 million, from $494 million in the year-earlier period.

The squeeze on polyethylene was also reflected in third-quarter results from BP Chemicals, where profits fell from $20.5 million to $17.7 million.

US CHEMICAL INDUSTRY UPSET OVER CLEAN AIR ACT

The chemical industry is baulking at stiff new enforcement and permit provisions in the Clean Air Act ammendments proposed by the U.S. President Bush. The fines mandate
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News from Japan

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Human DNA is composed of about 3 billion base pairs, which it is presumed, contain 50-100,000 genes. Of them, about 1,600 genes have so far been charted to gene maps, plus about 3,300 DNA fractions arranged on them.

SUMITOMO CHEMICAL SETS UP FIRM TO COMMERCIALIZE HYGIENIC GOODS

Sumitomo Chemical Co. started early in December Sumika Life-Tech Co., a wholly owned subsidiary for planning/-developement and sales of hygienic products.

The new company will market, as a first step, six items — most of them are pyrethroid insecticides for household use already developed by Sumitomo Chemical.

Sumika Life-Tech intends to develop and commercialize new hygiene-related products that will not enter into rivalry with existing products manufactured by other companies. The company can utilize a variety of the parent firm's formulating technologies for pyrethroid-based insectcidal compounds and other related chemicals.

Sumitomo Chemical has been supplying 11 technical-grade pyrethroid compounds exclusively for household-use products and 15 others including those for farm chemicals. The company believes it is possible to develop newer products not available on the market on the basis of these compounds and its techniques related to slow release and microcapsulization of ingredients.

MITSUBISHI KASEI TO STEP UP OVERSEAS CLINICAL TESTS ON DRUGS

Mitsubishi Kasei Corp. plans to inaugurate this year full-fledged clinical tests on drugs in the United States and Europe. To this end, the company is scheduled to open this year two liaison offices — one each in Britain and the States; they will serve as footholds for the planned clinical trials.

The British office will be staffed with a medical doctor and a few experts. Data obtained from clinical tests in the U.K. will also be available in the States, thereby improving the efficiency of R & D work.

The company already has several business footholds in the States and intends to select a site for the American liaison office taking into consideration the footholds' locations.

In West Germany, it has completed phase-I clinical tests on a self-developed cardiotonic. Phase-II tests for the product will be conducted by the planned British liaison office since West Germany is moving toward drastically curtailing medical expenses and, therefore, seems unsuitable for location of a foothold for pharmaceutical operations.

Mitsubishi Kasei regards pharmaceutical operations as one of the main pillars for its future business operations.

It has tied up with Nikken Chemicals and Tokyo Tanabe with regard to drug business. Mitsubishi's drug sales in the current fiscal year are projected to reach ¥30 billion.

In a bid to further build up drug operations, the company envisages promoting team-ups with U.S. and European enterprises. It has already established a joint-venture company with Synthelabo Pharmacie (France) and licensed Bayer (W.Germany) and Genentech (U.S.) to produce a cure for asthma and an antithrombotic agent respectively.

The two products have been developed by the Japanese company and are now being clinically tested by the two latter overseas companies.

MITSUBISHI TO INTRODUCE UCC PROCESS FOR PP PRODUCTION

Mitsubishi Petrochemical Co., has signed contracts with Union Carbide Chemical & Plastic Co. (Connecticut, U.S.) — Union Carbide Corp.'s subsidiary — with regard to introducing the Unipol process for polypropylene (PP) product from the UCC subsidiary and licensing Union Carbide Corp. to use —on an optional basis — high-activity PP catalysts developed by the Japanese company itself. The process concerned has been jointly developed by the UCC subsidiary and Shell Chemical (U.S.).

Mitsubishi Petrochemical — together with Mitsubishi Kasei and Dia Polymer (50/50 joint venture between Mitsubishi Petrochemical and Mitsubishi Kasei) —is scheduled to build an 80,000-t/y PP plant in Kashima (Ibaraki Prefecture) with completion scheduled for 1992 and has already informed MITI of the PP project. The Unipol process will be employed for the planned new plant.

Mitsubishi Petrochemical envisages developing new-grade PP suitable for the Japanese market by utilizing the in-house-developed high-activity PP catalysts for the Unipol process.

When the planned PP plant is started up, Mitsubishi Petrochemical plans to suspend operation of its 50,000-t/y PP plant now in operation.

CFC SUBSTITUTES SEEN BEING PRODUCED USING NEW PLANT

Du Pont-Mitsui Fluorochemicals Co. has almost reached a decision on building production facilities for two types of chlorofluorocarbon (CFC) at its Chiba factory with completion scheduled for [illegible] or 1994. They are HFC-134a and HCFC-123 substitutes for CFC-12 (refrigerant) and CFC-11 (foaming agent), respectively. The move is geared to the legal regulations for specified CFCs which went into force last July.

Du Pont — a U.S. chemical giant —is building a commercial plant for the two CFC substitutes with completion scheduled for this November thru December. The date for start-up of construction of the planned production facilities will be settled taking into account the operation of Du Pont's plant now under construction and the program for curtailing production/consumption of specified CFCs.

Keeping pace with Du Pont's world-wide CFC operations, DU Pont-Mitsui Fluorochemicals plans to push ahead with commercialization of CFC substitutes. The company intends to import from the U.S. company substitutes for CFCs which are in comparatively small demand in Japan. It is scheduled to domestically produce those for CFCs enjoying large demand here.

With regard to CFC-113, Du Pont-Mitsui fluorochemicals is considering supplying Japanese users with its substitute developed by the U.S. company.

TOHO TITANIUM TO EXPAND PRODUCTION CAPACITY FOR TITANIUM SPONGE

Toho Titanium Company, Ltd. will raise the production capacity for titanium sponge from 690 t/m to 750 t/m at its Chigasaki factory (Kanagawa Prefecture). As a result, its titanium-sponge production in the latter half of fiscal 1989 will register about 4,500 tons and production throughout 1989 is expected to reach about 8,500 tons.

Titanium sponge is mainly used for airplane parts and structural materials for chemical plants. Since demand for aircraft in Europe and America is now brisk, titanium sponge supplies tend to be tight.

Toho Titanium is the 2nd-largest titanium-sponge m
Osaka Titanium C
mainly delivering th
Mining Co. and Nip
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According to T
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the previous year
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of last year but th
price to increase is r
Titanium aims at in
boosting sales and
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TOYO JOZO PL DRUG PRODUCT

Toyo Jozo Co. is
up a joint venture in
synthesis and forma
possible partners ar
France and/or US

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The new joint firm
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these problems ten years ago and synthesized an AlN powder with sharp particle distribution and enhanced sinterability, and scored an industry first by sintering translucent AlN ceramics under atmospheric pressure. The company claims its products have ten times better thermal conductivity than alumina and are suitable for sintering into sheet fairings and laminated goods.

Tokuyama Soda constructed plant facilities in May 1985 capable of producing 10 tons of AlN powder per year. The company subsequently expanded annual capacity to 130 tons in early 1989 to meet rising demand from domestic and overseas ceramic and electrical machinery makers, and to further extend its business development in the U.S. and Europe.

Tokuyama Soda has established patents covering its highgrade AlN in the U.S., Canada, the U.K., West Germany, Taiwan and South Korea.

SHISEIDO TO SELL PRODUCTS IN SPAIN VIA LOCAL FIRM

Shiseido Company, Japan's top cosmetic maker, has announced that it has signed a contract with Invesgen S.A. to sell its products via the Spanish drug manufacturer's sales network. Under the agreement, Shiseido brand cosmetics will be sold at 20 department stores and 170 retail shops in Spain run by the Indoyen Group, the major Spanish business group to which Invesgen belongs, Shiseido said. Annual sales are targeted at ¥200 million for the initial year starting next autumn and at ¥1 billion within five years.

Sheiseido says it decided on the business in light of the strong demand expected in the Spanish cosmetics market, which has been growing rapidly ahead of the Barcelona Olympic Games scheduled for 1992. Shiseido expects the business linkage to serve as a key [illegible] entering [illegible] Spanish language markets abroad, such as Latin America.

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SODIUM THIOCYANATE
SODIUM TRIPOLY PHOSPHATE (STPP)
STARCH (LAXMI)
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New Developments from Japan

HIGH-ELASTICITY POLYESTER FIBER PIONEERED: TEIJIN

Teijin Ltd. has developed elastic polyester fiber (trade name: Rexe) by spinning polyester/ester polymer. The breaking extension of the new product is higher than 600% as in the case with elastic polyurethane fiber but the former is superior to the latter in resistance against moisture, heat and alkali.

The company plans to commercialise tricot by combining the new product with high-strength polyester fiber. The tricot will be applied to sports-wear as a first step. It will also be used in the form of lingerie and foundation garments sometime in the future.

The new fiber's cross section has the shape of cinquefoil. The company envisages starting commercial production of 40-300 denier fiber this October. Monthly production will be scaled up to 25 tons two years hence and to about 100 tons five to six years hence.

Spandex (polyurethane) is the dominant type of high-elasticity fiber. It is usually combined with nylon fiber and is extensively used in ladies' wear (underwear and stockings, etc.) and sportswear (ski/swim wear, etc.). The company intends to thrust into the elastic-fiber market by capitalising on the new product.

RODENTICIDE APPLIED TO SHEATH FOR ELECTRIC CABLE

Mitsubishi Cable Industries Ltd. has developed rat-repellent electric cables covered with a plastic (polyvinyl chloride) sheath containing microcapsules of cycloheximide used as a rodenticide. The cycloheximide microcapsules are being produced by Tanabe Seiyaku Co.

Mitsubishi [illegible] s supplied the new pro- [illegible] 78km long in total and have been used for transmission of high-voltage electric power and communications. This is the first time plastic-sheathed rat-repellent electric cables have been used in large quantities for commercial purposes.

The company claims that the new product will be usable for a long time (20 to 30 years). Electric cables for which high-level safety is required have hitherto often been covered with metallic tape for the purpose of preventing damage from rats. Plastic-sheathed cables have been applied only in limited areas.

Mitsubishi has pioneered the new product by employing the said microcapsules and improving the properties (water resistance, etc.) of polyvinyl chloride. It envisages applying the new product computers and OA equipment whose electric cables are often gnawed by rats.

ALUMINIUM REINFORCED WITH CARBON FIBER, CERAMIC WHISKERS

Osaka Gas Co. and Hitachi Zosen Co. have jointly developed aluminium reinforced with composite of coal pitch-based carbon fiber and ceramic whiskers. The new product is superior to carbon fiber-reinforced aluminium in abrasion resistance, vibration-damping properties and machinability.

It can be produced at lower cost than is the case with silicon-carbide whisker-applied composite material. Its potential applications are sliding parts for internal-combustion engines and bearing material.

The two companies uniformly combined isotropic pitch-based carbon fiber with ceramic whiskers and impregnated the resultant preform with aluminium. Hitachi Zosen molded the impregnated [illegible] into machinery parts using a high-pressure casting p
rings test-manufactured
form require no lubric
grease.

Since the new pro
ceramic whiskers, it c
molded into targeted pro
tion, the product requir
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based carbon fiber. Mol
from the new product
resistance 10 times that
employed as matrix. Th
damping properties are
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Cost of the abovemen
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duct is roughly 1mm in
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nies plan to supply t
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ishness. They inhibit the formation
controlling the odour at source. The
Intersept is long lasting because it
ut the foam insole rather than just
This creates a reservoir of Intersept
the foam insole from odour causing

introduced a new fatliquor, show-
l major trials. Solvol 60 solvent oil
l grain leathers or splits results in
good light stability. A combination
Solvoil 60 gives an unusually rich
60 is a mixture of sulphated marine
ents and other petroleum distillates.
ve fatliquor with a combined SO_3
pH of a 10% solution of approxi-
(4571), 1989.

ASF imparts high water resistance, good softness and a pleasing handle to leathers and for skins. It is used in combination with Densodrin E or GF in aqueous floats. Fixing with metallic salts is no longer necessary. It can also be diluted with small proportions of water-miscible solvents or water and applied to finished leathers by any conventional method to improve the handle or water resistance.

Relugan RV, also from BASF is a water soluble light fast retanning agent that has a very strong filling effect and does not yellow on exposure to elevated temperature. Used in the retannage it lightens the grain, reduces stretch and imparts a more compact handle to leather. It is particularly suitable for retanning spongy rawstock as well as sheep and goat skins. *Leather*, **191, (4571), 1989.**

ECO FRIENDLY PRESERVATIVE

Mergal KM270 from Riedel-de-Haen of Seelze West Germany is an optimised combination of the properties of the active ingredients which meet all the demands made of a leather preservative. It has a broad range of activity against bacteria, yeasts and mould and when used a concentration of 0.05-0.15% is enough for preservation of pickled pelts and wet blues. It has only a weak glycolic odour. The toxicity is low and the oral LD50 = 2600 mg/kg rat. It forms the emulsion in water which is straightforward to use in tanning. It is stable in media ranging from acidic to weakly alkaline. The aqueous predilution should not be left to stand because the active substances may precipitate. The spent liquor contains virtually no fungicidal residues and the biological treatment of the waste water will not be adversely affected. *Leather*, **191, (4571), 1989.**

LEATHER ABSTRACTS

Systematic structure-property relationships in polymeric coatings. R.D. Deanin, *J. Am. Leath. Chem. Assoc.*, **84**, 237, 1989.

The relationships between polymer structure, practical properties and performance in coatings are best organised in terms of structural features from smallest to largest; submolecular, molecular, intermolecular, and supermolecular. Greatest recent progress has been in supermolecular structure, particularly reinforced components, polymer blends, foams and multicomponent macro structures.

Effects of hydrophilic-hydrophobic properties of both fatliquoring agents and dyes on wet colour fastness. M. Nakamura and T. Inatsugi, *Hikaku Kagaku*, **35**, (2), 75, 1989.

The evaluation of the hydrophilic and hydrophobic properties of fatliquoring agents and then effects on the wet colour fastness for chrome-tanned leather were examined inorder to establish a guideline for optimising the manufacturing condition to obtain the fast colour dyeing. It is found that the critical surface tension of the leather affects markedly (a) liquid water uptake of leather and (b) the wet colour fastness which was estimated from the amount of dye extracted with alkaline perspiration solution. The improvement in the wet colour fastness took place from increase in hydrophobicity of the leather, to give a low Yc below 40 dyne/cm by using a fatliquoring agent such as C_{16} monoalkyl phosphate. This improvement is mainly due to the decrease in the interaction between the leaather and water regardless of the hydrophilic-hydrophobic balance of dyes.

Functional groups on collagen fiber cross-linked with epoxide. M. Nakamura and M. Masuoka, *Hikaku Kagaku*, **35**, (2), 91, 1989.

The acceleration effect of catalysts on the increase in the shrinkage temperature of acetone-dehydrated hide treated with epoxy resins was reported earlier. In the present study, the treated and untreated hide specimens were analysed by the use of a X-ray photoelectron spectroscopy inorder to identify the functional groups of collagen reacted with the epoxide. It showed that in addition reaction of the epoxide with primary amine on collagen is more predominant than that with the secondary amine. On the basis of previous results and the reactivity of the functional group to the epoxide, it was concluded that the cross linkage among collagen fibres is introduced mainly with the reaction between epoxide and primary amine and slightly with secondary amine and carboxyl group but not with hydroxyl group.

The need for automation. J.C. Crowther, *Leather*, 191, (4571), 240, 1989.

Although the leather industry is one of the last industries to be fully automated, systems exist which provide the assurance of quality, consistency in a major area of potential process error; wet and chemical processing. These systems allow management to concentrate more intensively on a smaller range of process variables and potential error. The net result is that the leather industry can show how quality consistency can be maintained to be the same degree as alternative man-made substitutes. At the same time productivity and flexibility is benefited.

High tech. leather making. B. Walker, *World Leather*, Oct./Nov., 8, 1989.

Most tanning processes in the world today contain a mixture of high and low technologies. It is important to make the distinction between genuine high technology and the application of high technology to the control of an operation which may be inherently low technology. Seeds of technology sown in the 1970s are slowly leading to the tannery of the future where computer control and existing new concepts in tanning come together to make a more consistent piece of leather more quickly and more reliably. In this paper the author explores the more important aspects of recent developments which will lead to high-tech leather making.

Tailoring leather for modern shoe making. B. Walker, *World Leather*, Oct./Nov., 22, 1989.

To enable the shoemaker to cope with present day manufacturing and marketing conditions, the advent of more and more automation in showmaking is calling for a more consistent leather. In the publication the author looks at various areas where tanners should concentrate their efforts towards this objective.

STATISTICS

Cattle stock	Pig stock	Sheep stock
4261	9851	13
4682	10423	22
4698	10718	24
4742	11061	26

blue
102 tons
988 tons Mainly from the USA, NZ and the UK.
2436 tons
5673

nent imports

	Pieces	Unit price (Year)
	482,000	15730
	496,000	16188
1986	637,000	13586
1987	1849,000	12371

Imports of leather handbags

	Pieces	Unit price (Year)
1984	1288,000	7184
1985	3193,000	3693
1986	4172,000	2885
1987	3027,000	4437

Domestic production of hides & skins

	Cattle	Calf	Pig
1983	1342928	42230	15,584,614
1984	1496348	40678	16,271,532
1985	1542116	34310	17,505,432
1986	1525029	27499	17,947,666
1987	1486221	21606	18,408,291
1988	1442382	18102	18,251,816

Cattle & Calf		Pigs		Sheep & Lamb	
('000 head)	Carcass (Kg)	('000 head)	Carcass (Kg)	('000 head)	Carcass (Kg)
1271	337	19293	74	2	23
1537	349	19258	74	4	25
1575	352	20639	74	5	26
1554	360	20995	74	6	28

Classic leather styles			Athletic shoes	Leather Uppers
Pairs	Unit price (Year)		Pairs	Unit price (Year)
1,045,000	5214		547,000	5600
1,035,000	5589	From	1032,000	4688*
1,535,000	4671	Korea	2773,000	2898*
2,224,000	4565		9418,000	2475*

Korea rest from Taiwan, Hong Kong & USA.
er, Oct./Nov. 1989.

LEATHER NEWS

CARBON DIOXIDE IS KEY TO NEW DELIMING METHOD

A new method of deliming hides in the tanning industry using carbon dioxide may result in higher quality skins, say Swedish company AGA. It is also claimed to reduce environmentally harmful discharges from the tannery and eliminate heavy manual labour from this stage in the process. Patents are pending in over 20 countries. One stage is converting raw hides to quality leather requires the application of slaked lime (calcium hydroxide) to remove hair and other unwanted material. This treatment makes the skin strongly alkaline and the next tanning stage requires it to be neutral, so a weak acid must be applied.

Most tanneries currently use weak solutions of acidic ammonium salts, lactic acid, boric acid or citric acid for deliming. The method developed by AGA in co-operation with Finnish leather manufacturers Viialan Nahka Oy uses a gas which includes carbon dioxide. Leather manufacturers normally avoid carbon dioxide like the plague. Small amounts dissolved in the deliming fluid cause precipitation of calcium carbonate, resulting in ugly patches on the leather — but the AGA method does not produce this problem.

The acid so far used in the deliming has always been supplied in powder form in sacks. When the powder is to be used, the treatment drum is opened and the sack containing, for example, ammonium salts, is lifted up and emptied into the drum, a heavy and monotonous job. Before the powder dissolves it comes into contact with the hides so localised areas receive a high acid concentration and can therefore be damaged. When carbon dioxide dissolves in water the pH value falls evenly in the whole drum, and no localised areas are subject to high levels of acidity.

Deliming with carbon dioxide results in a softer leather with a finer surface structure, say AGA. This is partly due to the fact that carbon dioxide can improve the fat removal process and increase the ability of the leather to bind with chromium. Using carbon dioxide as a deliming medium enables all the calcium to be removed without the leather becoming loose and weakened.

One of the most common types of chemical used for deliming is ammonium salts, eg. ammonium sulphate. Their release, as with other nitrogenous substances, leads to over-fertilisation of lakes and the sea. Excessive algae growth in recent years is said to have come about due to t
of nitrogenous waste entering the water. A switch
dioxide would therefore be an important contribu
leather industry in the fight against pollution.

Introduction of the carbon dioxide additive ca
using existing equipment and at moderate cost. A s
is, however, required, preferably outside plant bui
additive process can be automated, eliminating hea
labour from the process.

Rs. 6,000-CRORE LEATHER EXPORT WI REACH

India has exported leather goods worth Rs. 1
against the target of Rs. 2,000 crores for 1989-
Eighth Plan the country should be able to expor
crores of leather and allied products although the
the possibility of exporting Rs. 6,000 crores of th
ity, according to Mr. Prakash Mahtani, Presiden
Scale Leather Industries Federation. Speaking at
jubilee fete of the Institute of Leather Technology
Working School at Bombay recently, Mr. M
leather was being considered a thrust sector by
ment.

As labour costs in other countries was expensiv
to India, every effort should be made to imbibe s
training to workmen and the institutions like Le
ing School should be given all the encouragemen
the Government and leather trade and industry
tion would strive to rehabilitate leather training
Prof. Javed Khan, Maharashtra Minister for Edu
inaugurated the jubilee fete, said that the lead
could easily absorb 200 to 300 students after t
at the institute.

BENGAL TO BOOST LEATHER INDUST

The West Bengal government in its Eighth
to draw up a special programme to boost the lea
in the state. A 100-acre leather complex will
up near Santoshpur in south Calcutta and a tra
at Salt Lake. Speaking at the inauguration of
fair recently, Mr. Buddhadev Bhattacharya
Urban Development, said that entrepreneurs
forward and help the state in projecting the pot
industry in the state.

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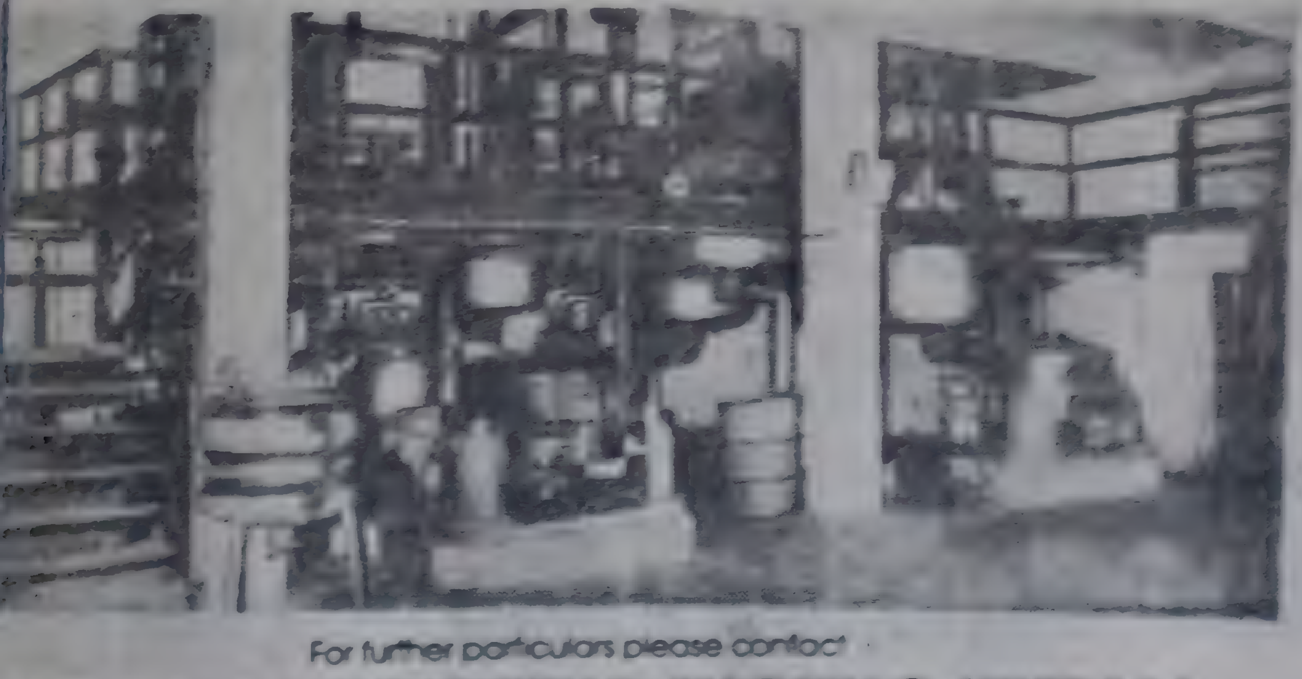

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responsibility for sales. He must be
identify, formulate sales policies, in
work, prepare sales forecast. Th
volves over-all planning and ach
targets, upgrading dealerships, gat
intelligence, recruiting, motivating a
technical sales perso

TECHNICAL SA
REPRESENTAT

The incumbent will be a B.Sc.
ably having a diploma in Tex
Printing.

Assignment: The incumbent wil
Manager in achieving the above

Salary and perks will not be a constraint

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chemicals

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- Nickel Sulphate
- Cobalt Sulphate

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Tel. Off. [illegible] Telex: [illegible]
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INFORMATION

ene Glycol Up

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ported
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y avai-
chlorite

was up by Rs. 6 per kg and bromine liquid by Rs. 5 per kg. In the intermediates section anthraquinone traded at Rs. 135 per kg and H. acid was up at Rs. 115 per kg. Activity was moderate.

We cannot guarantee the accuracy of the prices published in CHEMICAL WEEKLY as they are based only on the enquiries made by our correspondent - and, as such they are not FIRM PRICES as between a buyer and seller. The prices are published only with a view to giving some idea of the market conditions.

The prices are inclusive of Excise and Maharashtra Sales Tax.

(Prices as on January 23, 1990)

Per Kg.				
	Borax (Granular)	18.00	Cobalt oxide	300.00
	Borax (Powder)	22.00	Cresylic acid	62.00
	Boric acid (Tech)	26.00	Camphor (Indian)	105.00
2.50	Bisphenol-A	70.00	Cream of Tartar (Tech.) China	70.00
14.50	Butyl carbitol	110.00	Citric acid (Belgium) (Fresh)	47.00
14.00	Caustic soda (Flakes)	11.00	Citric acid (Indian) (Fresh)	43.00
17.00	Caustic soda (Solid)	12.00	Copper sulphate	25.00
5.60	Caustic soda (Lye)	10.00	Chromic acid	63.00
4.00	Calcium chloride 70% (Solid)	3.25	Ethylene urea	58.00
6.00	Calcium chloride 75-80%(fused)	3.50	Ferric chloride (Lumps)	5.50
22.00	Calcium chloride 36%		Ferric chloride (Anhydrous)	16.00
70.00	(Anhydrous)	5.00	Glue flakes	15.00
6.00	Calcium carbonate (precipitated)	4.25	Glue sheets	6.75
4.20	Calcium carbonate (Activated)	4.75	Gohsenol GH-17	110.00
			Hydro	44-57

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and
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[illegible]

Hyflosupercell	20.00
Hexamine (Resale)	35.00
Industrial Wax	25.00
Litharge	40.00
Lead Acetate (Tech.)	31.25
Lithopone	17,00
Magnesium chloride (Crystal)	3.00
Menthol crystal (Flakes)	900+Ex+ST
Menthol bold	665+Ex+ST
Menthol crystal cold	700+Ex+ST
Magnesium carbonate (Japan)	16.00
Magnesium carbonate (Indian)	18.00
Maleic Anhydride (Resale)	41.00
Mercury (34.5 Kgs)	10,500.00
Nickel chloride	110.00
Oxalic acid (Resale)	17.00
Peppermint oil (Rectified)	195+Ex+ST
Potassium carbonate (Indian)	25.00
Potassium carbonate (Imported)	36.00
Potassium bichromate	32.00
Potassium phosphate (Mono)	14.00
Potassium phosphate (Di)	14.00
Polyvinyl alcohol (No. 117)	115.00
Polyvinyl alcohol (No. 173)	120.00
Polyvinyl alcohol (No. 208)	150.00
Paraformaldehyde (Resale)	23.00
Phthalic anhydride 36% (Resale)	24.00
Pentaerythritol (Resale)	49.00
Paraffin wax	19+ST
Rangolite (German)	90+ST
Rangolite (Czech.)	70.00
Sodium sulphate (Fine)	3.70
Sodium sulphate (Coarse)	3.60
Sodium sulphide 50-52% (Flakes)	11+ST
Sodium sulphide 58-60% (Flakes) (TCL)	20.00
Sodium sulphide pure (Flakes)	12.25
Sodium nitrite (Resale) per 50 kg	730.00
Sodium chlorite 80% (Spain)	90.00
Soda Ash (Tata)	4.80
Soda Ash (Birla)	4.50
Soda Ash (Imp.)	4.50
Sodium bicarbonate	7.50
Sodium bisulphite	7.50
Sodium silicate	3.00
Sodium acetate	8.00
Sodium alginate	320.00
Titanium Dioxide (Anatase)	80+ST
Titanium Dioxide (Rutile – RCR_1)	105+ST
Tartaric acid	110.00
Trisodium phosphate	5.50
Thiourea	83.00
Urea (Tech.)	2.90
Vacuum salt	1.00
Zinc Dust	32.00
Zinc Oxide	58.00
Zinc chloride powder (Tech.)	12.50
Zinc sulphate	7.00

SOLVENTS	Per Kg.
Acetic Acid Glacial (Resale)	14.00
Acetic Anhydride (Resale)	37.00
Acetone (Resale)	20.50
Adipic Acid	70.00
Aceto Acetanilide	55.00
Aniline Oil	50.00
Benzoate Plasticiser	62.00
Butyl acrylate	84+ST
Butyl stearate	45.00

Butanol
Benzyl Alcohol
Benzyl Chloride
Benzo trichloride
Benzoyl chloride
Bromine Liquid
Chloroform
Carbon Tetrachloride
Cellosolve
Cyclohexanone
Cyclohexanol
Diacetone (Resale)
Diethyl Oxalate
Diethyl glycol (DEG)
Dioctyl Phthalate
Diallyl Phthalate
Dimethyl Phthalate
Dioctyl Adipate
Dibutyl Adipate
Dipentene
Dimethylamine 40%
Dimethylamine 50%
Ethyl Acetate
Ethyl Acrylate
Ethylene Dichloride
Ethylene Glycol
Formic Acid (Imp.)
Formaldehyde (Resale)
Glycerine (CP)
Glycerine (IW)
Hydrogen Peroxide 50% (Resale)
Isopropyl Alcohol
Isobutyl Alcohol (Resale)
Monoethanolamine (Resale)
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Methyl Isobutyl Ketone
Methyl Acrylate
Methylene Dichloride (Resale)

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Carbitol	60+ST
Meta Cresol	45.00
Nitrobenzene	25.00
Nitric Acid (Conc.) (RCF)	2.50
Ortho Cresol	30+ST
Phenol (Resale)	36.00
Propylene Glycol	58.00
Polyethylene Glycol (No.200)	58.00
Polyethylene Glycol (No.400)	62.00
Polyethylene Glycol (No.500)	52.00
Polyethylene Glycol (No.1600)	54.00
Polyethylene Glycol (No.4000)	70.00
Polyethylene Glycol (No.6000)	85.00
Para Cresol	110.00
Styrene Monomer	38+ST
Sorbitol	14.00
Sulphuric Acid	2.80
Trichloroethylene	29.00
Triethanolamine (Resale)	71.00
Turpentine Oil (Germany)	8.00
Turkey Red Oil (50%)	20.00
Vinyl Acetate Monomer	52.00

SOLVENTS	Per Litre
Benzene	11.00
N-Heptane	10.50
N-Hexane	13.00
Methanol	9.50
Solvent Naphtha Heavy	10.50
Solvent Naphtha Light	8.50
Toluene	13.50
Xylene	18.00

DYES INTERMEDIATES (PRICES ARE WITHOUT TAX AND EXCISE)

Alphanaphthylamine	63.00
Alpha Naphthol (Imp.)	170.00
Aceto Acetic Ester (Methyl)	66.00
Ammonium Molybdate	210.00
Anthraquinone	135.00
Anthranilic Acid	78.00
2 Amino 4 Nitrophenol	140.00
Blue B. Base (Local)	257.00
Beta Naphthol (Atul)	75.00
Benzidine Dihydrochloride (BDH)	95.00
Bromamine Acid	550.00
BON Acid	130+Ex+Ta
Chicago Acid (Atul)	355.00
Coach Acid	52.00
C. Acid (Imp.)	210.00
Cyanuric Chloride	140.00
2,4- DNCB	30.00
Dihydrothio PTOS (Imp.)	1,000.00
Dimethyl Aniline	70.00
Diethyl Aniline	160.00
Diamino stilbene disulphonic acid	168.00
3,3-DCB (Imp.)	175.00
Gamma Acid (Atul)	205.00
H. Acid (Atul)	115.00
G. Salt	75.00
Isophthalic Acid	45.00
J. Acid	350.00
J. Acid Urea	410.00
K. Acid	125.00
MPDS (German)	185.00
MNA	
Meta Ureido Aniline	
MPD (Local)	
MPD (Japan)	
Naphthenic Acid	
N-Methyl J. Acid	
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Naphthalene (Refined)	
Ortho Anisidine (OA) (Imp.)	
Ortho Dichloro Benzene (ODCB	
OT Base	
Para Dichloro Benzene (PDCB)	
Para Anisidine (PA local)	
PNA	
Para Cresidine (Imp.)	
Para Amino Azo Benzene (India)	
PNCB	
Para Amino Acetanilide	
1-Phenyl 3-Methyl 5-Pyrazolone	
Phenyl J. Acid	
Para Amino Benzoic Acid	
PT Base	
Rhoduline Acid	
Resist Salt 80%	
Resorcinol	
Sodium Naphthionate	
5-Sulpho-Anthranilic Acid	
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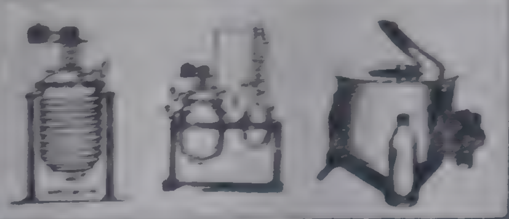

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Scheme

Bombay Dyes Market

(Prices as on January 23, 1990)

ACID COLOURS	Per Kg.
Acid Violet 4BS	*190.00
Acid Maroon V	110.00
Acid Orange II	112.55
Acid Orange IV	93.85
Acid Red A	137.00
Acid Scarlet 3R	126.35
Acid Red 3BN	*195.00
Acid Red R2R	132.00
Acid Red RS	88.00
Acid Patent Blue AS	*250.00
Acid Green V	*375.00
Acid Coomassie Blue	200.00
Acid Yellow 5GN	65.00
Acid Red PG	85.00
Acid Red GRS	78.00
Acid Black 10 BX	157.15
Acid Black BX	126.95
Acid Black Wax	135.50
Crocein Scarlet MOO	200.30
Procinil Yellow GS (ICI, UK)	265.30
Procinil Red GS (ICI, UK)	530.00
Procinil Blue RS (ICI, UK)	315.00
Procinil Scarlet G (ICI, UK)	600.00
Procinil Orange G (ICI, UK)	250.00
Procinil Rubine (ICI, UK)	550.00

* To get resale price add 8% tax

DIRECT COLOURS	Per Kg.
Yellow 3GX	114.00
Sun Yellow RCH	175.85
Fast Yellow GCH	171.50
Yellow CRG Hy. Conc.	721.00
Fast Yellow GS	126.96
Fast Yellow D4RS	116.95
Viscose Orange A	210.35
Fast Orange GR	171.50
Red	122.55
Dark Tan	98.15
Red 1R	98.15
Red 4B	217.55
Bordeaux BR	[illegible]
Fast Scarlet 4BS	223.50
[illegible]	[illegible]
Bordeaux Hy. Conc	249.20
Congo Red R	[illegible]
Brill. [illegible]	[illegible]
Brill. Fast Helio 2R	365.85
Brill. Fast Helio 2RS	177.30
Brill. Fast Helio BS	116.10
Brill. Violet Extra	181.45
Blue 2B	102.50
Blue G	220.45
Sky Blue FB	242.00
Copper Blue GR	190.25
Fast Greenish Blue GL	114.60
Developed Black BT	149.95
Blue NB-2B	348.45
Blue NB-2BG	214.70
Developed Black NB-GHB	214.70
Green B	142.75
Green NB-B	218.90
Green 2B-N	218.90
Brown MR	197.40
Brown CN	137.00
Golden Brown G	175.85
Catechin G	155.70
Omega Tan	161.45
Catechin GS	102.80
Black E Hy. Conc.	180.15
Black E Extra Hy. Conc.	180.15
Black NB-ER Hy. Conc.	290.50

DISPERSOL COLOURS	Per Kg.
Red B 3B Conc	611.50
Red B 2B Conc	797.90
Red CB Powder	1048.25
Red D2B Powder	589.85
Violet C 4R Conc.	1202.70
Blue BG Conc	580.65
Blue BN Powder	[illegible]
Blue B 2R Powder	588.25
Navy BT Conc	531.95
Blue B 2G Conc	577.95
Black BT Conc	319.50
Blue BR	482.40
Yellow T6L	[illegible]
Yellow 3RB	[illegible]
Yellow 3G	[illegible]
Yellow	[illegible]
Yellow 4L	[illegible]
Yellow Brown FRL	[illegible]
Yellow FRL	[illegible]
Gold Yellow DG	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

Red 2S
Red FB
Red Violet FBL
Orange 3R
Violet 3R
Violet RL
Violet 6R
Scarlet RR
Rubine 3B
Rubine CB
Blue GL
Blue BGF
Navy Blue RE
Brown 3REL
Black GEL
Dark Brown 3B

BASE COLOURS

Fast Yellow GC
Fast Orange GC
Fast Scarlet R
Fast Scarlet RC
Fast Scarlet RCR
Fast Scarlet G
Fast Scarlet GN
Fast Scarlet GG
Fast Scarlet GGS
Fast Red B
Fast Red RC
Fast Red R Flakes
Fast Red TR
Fast Red TR Oil
Fast Red RL
Fast Red KB Oil
Fast Bordeaux GP
Fast Garnet GBC
Fast Violet B
Fast Blue BB

NAPHTHOL COLOURS

ASG
AS
ASBW
[illegible]
[illegible]
[illegible]
[illegible]

360.00
336.15
234.30
249.95
2662.35
2459.45
143.00
518.65
652.60

Per Kg.
207.95
145.65
168.55
214.75
276.65
332.30
275.45
387.65
201.15
366.10
244.70
303.30
197.95
313.15
213.55
245.05
179.80
243.45
182.00
160.05
219.35
137.10
163.65
219.55
175.40
334.75
406.40
207.85
366.20
298.85
338.15
[illegible]
[illegible]
[illegible]

Blue H-FRD	395.80
Navy Blue HSR	393.75
Blue H 5RX	296.20
Navy Blue M3R	356.70
Brill. Blue MR	405.60
Brill. Blue M RX	214.20
Brill. Blue M-G	228.45
Blue M 4GD	369.40
Navy Blue M RB	341.85
Turquoise M-G	240.30
Brill. Blue M GX	516.25
Blue 3R Acra Powder	718.20
Dark Brown H 6R	248.45
Cobalt Oxide	285.00
Green H4BD	287.00
Green H-E4BI	169.80
Red Brown H IF	143.25
Orange Brown H 2B	209.05
Brown M GRN	188.80
Black H-N	214.20

SULPHUR COLOURS	Per Kg.
Navy Blue	210.35
Green G	194.55
Black Grains Extra	72.25
Black Grains OG	73.70
Black GXE Conc.	70.85
Black GXE	57.90
Black GXR	69.40
Black Grains 800	62.80
Black EXR Grains	73.70
Black EXR Grains 800	59.35

VAT COLOURS (ICI)	Per Kg.
Yellow 5G Supra Disperse	561.85
Yellow 5G Acra Conc	918.60
Gold Orange 3G Pdr. Fine	1158.45
Brill. Orange 6R Pdr. Fine	624.35
Gold Orange 3G Supra Disp	698.85
Brill. Orange 6RX Powder	394.30
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
Brill. Purple 2R Hy. Conc	744.25
Brill. Purple 4R Supra Disp	604.25
Brill. Purple 2R Acra Conc	779.85
Blue 2R Powder Fine	675.30
Blue BC Acra Con Pdr. Fine	1013.15
Blue BC Conc. Pdr. Fine	713.65
Blue R Conc. Pdr. Fine	719.70
Blue Conc. Powder	645.80
Brill. Blue 2R Hy. Conc	378.85
Blue RR Supra Powder	629.35
Brill. Blue 2R Supra Disp	118.65
Dark Blue 2R Powder Fine	512.85
Blue BC Supra Disp	419.85
Jade Green XBN Powder Fine	589.85
Jade Green XBN Acra Conc Pdr	1028.05
Jade Green 2G Pdr. Fine	533.25
Jade Green 2G Ptg. Paste	125.40
Jade Green XBN Ptg. Paste	126.30
Jade Green 2G Supra Disp	618.00
Olive D Pdr. Fine	563.90
Olive Green B Supra Disp	421.70
Jade Green XBN Supra Disp (N)	327.30
Olive OMW Powder Fine	889.85
Olive OMW Supra Disp	598.25
Olive D Supra Disp	381.70
Olive R Supra Disp	470.25
Olive D Ptg. Paste	193.10
Olive Green B Ptg. Paste	139.10
Olive Green B Acra Conc	741.40
Olive R Acra Conc	779.85
Brown R Pdr. Fine	[illegible]
Dark Brown 2R Fine	608.25
Brown G Supra Disp	560.05
Brown 2G Supra Disp	[illegible]
Brown R Supra Disp	547.15
Brown BR Powder	887.70
Dark Brown 2R Ptg. Paste	217.10
Dark Brown 2R Supra Disp	[illegible]
Brown G Acra Conc	987.95
Brown M Powder Fine	768.80
Grey M Supra Disp	585.45
Blue RC Acra Conc. Pdr. Fine	752.70
Direct Black AC Supra Disp	419.75
Direct Black AC Pdr. Fine	474.75
Direct Black CH Supra Disp	[illegible]
[illegible]	[illegible]

Delhi Market

DELHI: JAN. 19, (NNS) Mercury suffered a setback of Rs. 700 at Rs. 11,200 per flask in the Delhi chemicals market during last week thanks to profit taking selling by stockists in view of lower advices from Bombay. Buyers were out of the market. In the absence of demand from textile units, chatkolite and sulolite declined further by Rs. 2.50 and Rs. 3 at Rs. 53.50 and Rs. 67 per kg respectively, while rangolite Germany moved up by Rs. 2 at Rs. 85 due to fall in import from Germany. Inspite of good seasonal demand by gur and khandsari manufacturers, sodium hydrosulphite ruled quiet at Rs. 34/36.50 because of comfortable stock position in the market.

Sodium nitrite jumped up sharply from Rs. 800/900 to Rs. 1150 per 50 kg on rumours of hike in its prices by manufacturers. Soda bicarb and soda ash Tata advanced by Rs. 2/9 at Rs. 287 and Rs. 355 per bag owing to paucity of supply. Citric acid recorded a rise of Rs. 25/50 at Rs. 2,100/2,375 owing to sustained demand by consumers alongwith higher advices from Bombay. As a result of increased demand from paneer manufacturers, tartaric acid France resumed higher by Rs. 100 at Rs. 13,700 while desi tartaric acid Trishul Marka ruled quiet at Rs. 4,150 per 15 kg. Paraffin wax hardened by Rs. 10 at Rs. 860 in view of increased demand by candle manufacturers. Titanium dioxide Anatase moved up by Rs. 3 at Rs. 84 on account of increased demand by plastic units. K-Brand titanium dioxide also sold higher at Rs. 75 instead of Rs. 74 while turnover was poor in RC-822 and RCR-2 on withdrawal of demand.

On reports of arrivals of about 3000 kg of menthol from Sambhal, Moradabad, Rampur, Chandausi & Amroha areas of U.P. during the week and fall in demand by consumers, menthol flake and bold dropped by Rs. 17/20 at Rs. 345 & Rs. 385 per kg. Menthol medium also slumped from Rs. 390 to Rs. 375.

Due to poor enquiries mentha oil declined by Rs. 15 at Rs. 245/265 and DMO ruled quiet at Rs. 125. Naphthalene balls drifted lower by Rs. 50 at Rs. 1,450 for want of support while caustic soda rose by Rs. 5 in view of stopped supply by Modi companies. Later prices turned easy and quoted at Rs. 535 thanks to better inflow by Gwalior Rayon. No change was reported in dyes and colours.

(DELHI MARKET RATES AS ON JANUARY 19, 1990)

Ammonia Bicarb (Per 25 Kg.)	148.00	Rangolite (Per Kg.)	85.00
Mercury (Per flask)	11,200.00	Tartaric acid (Imp) (50 Kg.)	13,700.00
Soda ash (Per bag)	340/355.00	Sulolite (per Kg.)	67.00
Ammonium Chloride (50 Kg.)	110/180.00	Chatkolite (per Kg.)	53.50
Caustic soda flakes (50 Kg.)	535.00	DMO	125.00
Citric acid (Per 50 Kg.)	2,100/2,375.00	Boric acid Technical (Per 50 Kg.)	1,350.00
Stable Bleaching Powder Shriram (Per 25 Kg.)	101.00	Paraffin Wax (Per 50 Kg.)	860.00
Stable Bleaching Powder KCI (Per 25 Kg.)	90.00	Tartaric Acid (Indian Per 15 Kg.)	4,150.00
Stable Bleaching Powder Maruti (Per 25 Kg.)	90.00	Borax Granular (Per 50 Kg.)	835.00
Stable Bleaching Powder Modi (Per 25 Kg.)	[illegible]	Borax Crystal (Per 50 Kg.)	835.00
Sodium Bicarbonate (50 Kg.)	287/290.00	Sodium Nitrite (Per 50 Kg.)	1150.00
Sodium Hydrosulphite (Per Kg.)	34.00/36.50	Sodium Nitrate (Per 50 Kg.)	450.00
		Camphor Thal (Per Kg.)	104.00
		Camphor Powder (Per Kg.)	95.00
		Menthol Bold (Per Kg.)	385.00
		Menthol Medium (Per Kg.)	375.00

Menthol Flake (Per Kg.)	
Menthol Oil (Per Kg.)	
Glycerine (Per Kg.)	
Sodium Silicate (Per quintal)	
Hexamine (Per Kg.)	
Acetic Acid Glacial (Per Kg.)	
Copper Sulphate (Per quintal)	1
Formic Acid (Per Kg.)	
Formaldehyde (Per Kg.)	
Hydrogen Peroxide (Per Kg.)	
Calcium Carbonate (Per Tonne)	
Acid Slurry Soft (Per Kg.)	
Acid Slurry Hard (Per Kg.)	
Phosphoric Acid (Per 50 Kg.)	
Potassium Nitrate (Per quintal)	9
Potassium Permanganate (Per 50 Kg.)	2,8
Sodium Bichromate (Per 50 Kg.)	1,5
Trisodium Phosphate (50 Kg.)	
Titanium Dioxide Anatase (Per	
Titanium Dioxide RC-822 (Per	
Titanium Dioxide K-Brand (Per	
Titanium Dioxide RCR-2 (Per	
Zinc Oxide (Per metric tonne)	42,3
Phenol Carbolic Acid (Per Kg	
Carbon Tetrachloride (Per Kg	
Chloroform (Per Kg.)	
Sodium Sulphate (Per metric tonne)	3
Naphthalene Balls (Per 50 Kg	

DYES & COLOURS

- Naphthol AS
- Naphthol ASG
- Naphthol ASBS
- Naphthol ASTR
- Naphthol ASOL
- Naphthol ASBO

DIRECT DYES

- Black E. Conc.
- Diazo Black B.T.
- Green B
- Blue 2-B
- Blue 2-B 225% (JNR)
- Sky Blue FB
- Basic Auramine
- Basic Rhodamine
- Basic Methylene Blue
- Basic Violet
- Basic Malachite Green
- Acid Orange
- Congo Red H/C

Madras Market

prices is conti-
lability of buta-
s Bombay plant
bide plant) the
ve come down
prices of butyl
hthalate where
a raw material.
ents have also come down due to various reasons but primarily due to availability of imported stocks which had forced the prices down.

The prime sufferers are MEG, DEG, MEK, methylene chloride, methanol etc. where imports have been very heavy during the recent times.

ARKET RATES AS ON JANUARY 20, 1990)

kg)	14.50
free	
	4,000.00
	145.00
er MT)	3,000.00
	31.00
kg)	9.00
g)	8.00
er kg)	24.00
0 kgs)	220.00
	700.00
Mettur	
	10,800.00
Andhra	
	10,800.00
Solid	
	3,000.00
drous	
	5,750.00
ctivated)	
	6,000.00

Calcium Carbonate (Precipitated) (per MT)	5,000.00
Citric Acid (per kg)	48.00
Copper Sulphate (per kg)	24.00
Cresylic Acid 98-99% (per kg)	130.00
Pure Para Cresol 96% (per kg)	85.00
Meta Para Cresol 42% (per kg)	50.00
Formic Acid (per kg)	26.00
Formaldehyde (per kg)	8.00
Glue Flakes (per kg)	15.00
Glycerine I.W. (per kg)	45.00
Hydrosulphite of Soda (TCPL) (per kg)	36.00
Hydrosulphite of Soda (IDI) (per kg)	40.00
Hydrosulphite of Soda (BASF) (per kg)	40.00
Hexamine (per kg)	30.00
Hyflosupercell (per kg)	19.00
Hydrogen Peroxide (per kg)	31.25
Litharge (per kg)	40.00
Lead Acetate (per kg)	38.00
Magnesium Carbonate (per kg)	16.00
Magnesium Chloride (per kg)	3.50
Maleic Anhydride (per kg)	40.00
Menthol Crystals (per kg)	350.00
Oxalic Acid (per kg)	20.00
Paraffin Wax (per kg)	17.00
Potassium Bichromate (per kg)	38.00
Phosphoric Acid (per kg)	25.50
Polyvinyl Alcohol Powder (per kg)	130.00
Pentaerythritol (per kg)	49.00
Phthalic Anhydride (per kg)	29.00
Soda Ash (TAC) (per 75 kgs)	354.00
Soda Ash (TATA) (per 75 kgs)	354.00
Sodium Bicarbonate (TATA) (per 50 kgs)	370.00
Sodium Silicate (per MT)	3,400.00
Sodium Bichromate (per kg)	28.00
Sodium Nitrate (per kg)	8.00
Sodium Nitrite (per kg)	15.00
Sodium Sulphide Flakes (per kg)	14.00
Sodium Bisulphite (per kg)	4.50
Sodium Alginate (per kg)	220.00
Sodium Acetate (per kg)	7.00
Sodium Sulphate (Anhydrous), (per kg)	3.00
Titanium Dioxide (Anatase), (per kg)	75.00
Titanium Dioxide (Rutile) (per kg)	89.00
Trisodium Phosphate (per kg)	7.00
Urea (Technical) (per kg)	3.00
Zinc Oxide (per kg)	52.00
Zinc Chloride Powder (per kg)	14.00
Zinc Sulphate (per kg)	7.00

SOLVENTS

Acetone – HOCL (per kg)	19.50
Butanol (per kg)	34.00
Butyl Acetate (per kg)	42.00
Benzene (per lit)	15.00
Cellosolve (per kg)	50.00
Carbon Tetra Chloride (per kg)	23.00
Chloroform (per kg)	28.00
Diacetone Alcohol (per kg)	30.00
Diethylene Glycol (per kg)	38.00
Dichloroethane (per kg)	18.00
Di-octyl Phthalate (per kg)	44.00
Di-N-butyl Phthalate (per kg)	44.00
Ethyl Acetate (per kg)	22.00
Isopropyl Alcohol (per kg)	28.00
Methanol (per kg)	10.00
Methylene Chloride (per kg)	20.00
Methyl Ethyl Ketone (per kg)	34.00
Methyl Isobutyl Ketone (per kg)	42.00
Phenol (per kg)	36.00
Sorbitol (per kg)	15.00
Triethanolamine (per kg)	95.00
Trichloroethylene (per kg)	26.00
1-1-1 Trichloroethane (per kg)	29.00
Turpentine (per lit)	18.50
Toluene (per lit)	16.00
Xylene (per lit)	[illegible]

International Bulk Chemical Prices

Spot Prices are as on January 3, 1990

Naphtha prices have risen further to $186-188/ton cif NWE due to the cold snap which has disabled the US Gulf refinery industry. Ethylene prices have jumbed to $350-370/ton cif NWE due to the temporary closure of up to 20 US crackers. Propylene remains relatively stable at DM560-580/ton cif NWE and is hardly being affected by events in the U.S. Butadiene prices are nominal at the level $540-560/ton fob NWE. Benzene prices have firmed to $390-400/ton fob NWE after dropping to $360/ton fob NWE, over the holidy period. The market is rising due to fears over the number of US shutdowns. Toluene has also been strongly influenced by events in the US, with numbers ranging from $270-290/ton, although some sellers are quoting numbers above $300/ton.

Paraxylene continues to drift away, with prices nominal at $450-470/ton fob NWE. Orthoxylene prices remain stable at $295-305/ton fob NWE. X
have seen little activity, wi
stable at $260-265/ton for so
duct and virgin at $260-27
NWE. Styrene continues to
T1 prices up to $970-1
NWE. Methanol T1 prices have
to $95-100/ton cif NWE, due to
demand and continued product
ficulties hampering supplies. T1
is now in the range of DM
fob NWE.

Product	European Spot price range $/ton	US price range $/ton
Ethylene	350-370 (cif)	463 (spot)
Propylene (100% basis)	327-339 (cif)	276-286 (spot)
Butadiene	540-560 (fob)	573 (spot)
Benzene	390-400 (fob)	416-419 (spot)
Toluene	270-290 (fob)	300-306 (spot)
Xylenes (virgin)	260-270 (fob)	264-266 (spot)
(solvent)	260-265 (fob)	n.a.
Styrene	1060-1080 (T2)(fob) 970-1040 (T1) (cif)	969-992 (spot)
Paraxylene	450-470 (fob)	n.a. (spot)
Orthoxylene	295-305 (fob)	n.a. (spot)
Ammonia	88-102 (cif)	n.a.
Methanol	120-125 (T2)(fob) 95-100 (T1)(cif)	n.a.
Naphtha	186-188 (cif)	n.a.

Shipping News

VESSELS DUE IN BOMBAY FOR EXPORT LOADING

Due Date (1)	Steamer's Name & Flag (2)	Agents (3)	Will load for (4)
27/1	Supanya (Voy-32)	Samrat	Longbeach; Oakland; Seattle; Los Angeles; San Francisco; Philadel Savannah; Charleston; Batliore; Norfolk; New York; Boston; St. Joh Vancouver; Montreal; Toronto; New Orleans; Houston. (Carting at M.B.)
		U.L.A./	Los Angeles; San Francisco; Oakland; Seattle; Vancouver; Charlesto Houston; Norfolk; Baltimore; New York; Halifax, Montreal; Toro S. American and West Indian Ports. (Carting at M-171/173 C.D.)
		E.S.P.L.	Longbeach; Charleston; New York; St. John; Norfolk; Oakland Vancouver (B.C.); Seattle; Montreal; Baltimore; Boston; Chica Dallas; Houston; Longview; Los Angeles; New Orleans; Ph Portland; San Diego; Mexico City; San Francisco; Siouxfal Sacramento; Stockton; Halifax; Toronto; Savannah; Tacoma; Mi and all other destinations. Also Caribbean ports. (Carting at Ma Bunder)

	(3)	(4)	(5)
	Trident/	S. American; Caribbean and Central American ports. (Carting at T.P. No. 4).	
	Archee	S. American Ports. (Carting at M. Jetha Cotton Depot).	
)	Greenways	New York; Newark; Baltimore; Charleston; New Orleans; Houston; Boston; Providence (RI); Philadelphia; Norfolk; Savannah; Jacksonville; Wilmington; Miami; Montreal; Toronto; Bermuda; Los Angeles; Longbeach; San Francisco; Oakland; San Diego; Stockton; Richmond; Almeda; Redwood City; Sacramento; Seattle; Portland; Vancouver (B.C.); Tacoma; Longview; Chicago; Dallas; Various inland destinations and Caribbean ports. (Carting at G/H Cotton Depot).	4/1
hiever)	Seaspeed/	New York; Baltimore; Norfolk, Savannah; Charleston; Houston and S. American ports. (Carting at Hay Bunder No. 5).	4/2
	Oceanic	New York; Baltimore; Philadelphia; Chicago; Boston; Norfolk; Atlanta Charleston; Savannah; Miami; Houston and other inland destinations in U.S. East Coast and S. American ports. (Carting at Wadi Bunder No. 3).	
oner	Marathon	Boston; New York; Baltimore; Norfolk. (Carting at T.P. No. 3).	4/2
e (Br)	Patvolk	Montreal and Toronto via Halifax; New York; Boston; Norfolk; Charleston; Houston; Savannah; Wilmington; Philadelphia; Baltimore; New Orleans; & FCL Chicago; Milwaukee; Atlanta; Dallas. (Carting at H.B. No. 5).	4/2
ine -9003)	Volkart Fleming	New York; Philadelphia; Baltimore; Norfolk; Charleston; Savannah; Jacksonville; Miami; New Orleans; Houston; Toronto; Montreal; Chicago; Atlanta; Denver; Dallas; Wilmington; Milwaukee; Detroit; Minneapolis; Memphis; Nashville; Cleveland; Phoenix; Boston; Los Angeles; Vancouver; Seattle; Sanfrancisco; Portland; Longbeach; Mexican and S. American ports. (Carting at M.O.D. No. 2).	4/2
on	M.S.P.L.	Philadelphia; Baltimore; Norfolk; New Orelans; Houston; Savannah; New York. (Carting at P/Q-PD).	7/2
ar	Samrat/ Hindustan/ L. Triest	Boston; New York; Baltimore; Norfolk; Charleston; P. Mouth; P. Lauderdale; Miami; New Orelans; Savannah; Jacksonville; P. Everglades; Philadelphia; Halifax; Montreal; Toronto and S. American Ports. (Carting at M-171/173 Cotton Depot for L. Triest) (Carting at M.O.D. No. 1 for Samrat and Hindustan).	7/2
	V. Fleming	Lagos/Apapa; Dakar; Freetown; Monrovia; Lome; Cotonou; Douala; Tema. (Carting at M.O.D. No. 2).	4/2
ine mann	Merzario	Dakar; Abidjan; Monrovia; Lome; Douala; P. Noire; Matadi; Libreville; Cotonou; P. Gentil; Logos; P. Harcourt; Warri; Freetown; Conakry; Louanda; Nouakchott; Guinea; Blassa. (Carting at M.O.D. No. 2).	1/2
	U.L.A./ Trident	Lagos/Apapa; Abidjan; Lome/Matadi. (Carting at M-171/173 C.D.). Tema/Lome; Lagos; Matadi; Lobito; Luanda; Freetown; Cotonou; Douala; P. Harcourt; Abidjan; Monrovia; Dakar. (Carting at T.P. No. 4).	31/1
chiever	Seaspeed	West African ports. (Carting at Hay Bunder No. 5).	4/2
ar	L. Triest	With T.P. Lagos/Apapa; Abidjan; Dakar; Douala; Cotonou; Nouakchott; Libreville; Tema; Matadi; Conakry; Freetown. (Carting at 171/173 Cotton Depot).	7/2
	Kanika	Antwerp; Rotterdam; Hamburg; Le Havre; Genova; Gothenburg Stockholm; Copenhagen; Oslo; Helsinki; London; Felixstowe; Tilbury. (Carting at T.P. No. 3).	31/1
ann	Samrat/ Hindustan/ Merzario	Felixstowe; Hamburg; Rotterdam. Also London; Liverpool; Leixoes; Lisbon; Manchester; Avonmouth; Wembly; Birmingham; Liecester; Le Havre; Amsterdam; Bremen; Antwerp; Copenhagen; Leeds; Aarhus; Gothenburg; Oslo; Stockholm; Helsinki. Belfast and all destination in U.K.; Benelux Germany; Italy; France; Switzerland and Austria. (Carting at M.O.D. No. 2 for Merzario) (Carting at M.O.D. No. 1 for Samrat & Hindustan).	1/2
2)	Oceanic	Jeddah; Rijeka.	5/2
(Malta)	Samarth	Jeddah; Hodeidah; P. Sudan.	31/1
chiever Ger)	Merzario/	Jeddah; Hodeidah; P. Sudan; Revanne; Ancona; Piraeus; Venice; Trieste. (Carting at M.O.D. No. 2).	4/2

(1)	(2)	(3)	(4)
		Seaspeed/	Tilbury; London; Felixstowe; Manchester; Liverpool; Avonmouth; Le Havre; Rotterdam; Hamburg; Antwerp; Bremerhaven and Scandinavian ports. (Carting at Hay Bunder No. 5).
		L. Triestino/	Jeddah; Trieste; Venice; Ravenna; Rijeka; Naples. (Carting at M-171/173 C.D.).
		Oceanic/	P. Said; Limassol; Alexandria; Casablanca; Tripoli; Livorno; Genoa; Mersin; Iskendron; Izmir. (Carting at Wadi Bunder No. 7).
		Killick	Jeddah; Felixstowe; London; Liverpool; Manchester; Bristol; Avonmouth; Leeds; Glasgow; Tilbury; Birmingham; Dublin; Belfast; Rotterdam; Hamburg; Le Havre; Antwerp; Bremen; Bremerhaven; Fos; Valencia; Marseilles; Barcelona and Scandinavian ports. (Carting at M-178/180 Cotton Depot).
30/1	Oyster Bay	P&O	Assab; Djibouti; P. Sudan. (Carting at Timber Pond No. 4).
30/1	Leninskiy Pioner (Rus)	Transocean/	Tilbury; Avonmouth; Liverpool; Manchester; London; Felixstowe; Birmingham; Antwerp; (Rotterdam); Hamburg; Bremen; Copenhagen; Gothenburg; Oslo; Stockholm; Malmo; Leeds. (Carting at T.P. N
		I.S.S.Co.	Felixstowe; Tilbury; Antwerp; Rotterdam; Hamburg; Bremerhaven & Scandinavian ports via Hamburg. (Carting at Wadi Bunder No. 7).
2/2	Medipas Star	L. Triestino	Jeddah; Barcelona; Marseilles; Genoa; Leghorn; La Spezia; Naples with TP Trieste; Venice; Ravenna; Bari; Koper; Rijeka; Las Palmas; Santacruz; De Teneriffe; Malta; Limmassol; Alexandria; Casablanca; Tunis; Algiers; Lattakia; Tripoli; Benghazi; Oran; Point-a-Pitre; Port De France. (Carting at M-171/173 Cotton Depot).
		Sama/ Hindustan/	Barcelona; Marseilles; La Spezia; Livorno; (Leghorn); Genoa; Naples and other Italian ports and FCL only Beirut; Alexandria; Valletta; Lattakia; Mersin. (Carting at M.O.D. No. 1 for both).
		Merzario	Genoa; Leghorn; La Spezia; Naples; Salerno; Marseilles; Barcelona (Carting at M.O.D. No. 2).
6/2	Sam Houston	M.S.P.L.	Aqaba; Assab; P. Suez; (Alexandria). (Carting at P/Q-PD).
27/1	Supanya	Silvership	Chittagong. (Carting at Timber Pond No. 3).
27/1	Supanya (V-32)	Samrat/	Singapore (Direct); Penang; Jakarta; Surabaya; Belawan; P. Kelang; Bangkok; Manila; Hongkong; Kaohsiung; Keelung; Taichung; Bu Yokohama; Nagoya; Kobe; Osaka; Tokyo. (Carting at Mallet Bunder).
		Trident/	Busan; Hongkong; Keelung; Kobe; Nagoya; Yokohama; Penang; P. Kelang; Bangkok; Kaohsiung; Singapore. (Carting at T.P. No.
		U.L.A./	Singapore; Penang; P. Kelang; Keelung; Kaohsiung; Bangkok; Busan; Jakarta; Hongkong; Japan and Chinese ports. (Carting at M-171/1 Cotton Depot).
		E.S.P.L.	Singapore; Hongkong; Bangkok; Jakarta; Kaohsiung; Keelung; Pena P. Kelang; Kota; Kinabalu; Kulaobelati; Bintulu; Kuching; Labua Vietnam (P.R.C.). (Carting at Mallet Bunder).
		I.M.E./	Singapore; Bangkok; Hongkong; Keelung; Busan; Kobe; Yokohama; Nagoya. (Carting at Wadi Bunder No. 3).
		M.C.S./	Singapore; Hongkong; Keelung; Kaohsiung; Jakarta; Surabaya; Bangkok; Penang; P. Kelang. (Carting at H.B. No. 4 for M.C.S.)
		Kamka/	Bangkok; P. Kelang; Djakarta; Keelung; Busan; Hongkong. (Carting T.P. No. 3).
		Silver Ship	Singapore; Far East & Japan ports. (Carting at T.P. No. 3).
28/1	Lyudmila Stal	Transocean	Singapore; Main Japan ports.
29/1	Uni Pioneer (V-022(V)Par)	Greenways	Singapore; Penang; Port Kelang; Bangkok; Djakarta; Surabaya; Ma Cebu; Kaohsiung; Keelung; Osaka; Yokohama; Kobe; Shimizu; Nagoya; Pusan; Hongkong. (Carting at G/H Cotton Depot).
6/2	Sam Houston	M.S.P.L.	Singapore. (Carting at P/Q-PD).
9/2	Kaushik (Tug)	Daya	Hongkong; Keelung; (Kaohsiung); Kobe; Yokohama; Tokyo;
27/1	Supanya (V-32)	Samrat	Brisbane; Sydney; Melbourne; Adelaide; Fremantle; Burnie. (Carting at M.B.).
		Trident	Brisbane; Sydney; Melbourne; Adelaide; Fremantle; Burnie; Wellington; Lyttelton. (Carting at T.P. No. 4).
		[illegible]	Sydney; Melbourne; Adelaide; Brisbane. (Carting at M. [illegible]
		Transworld	Sydney; Melbourne; Adelaide; Fremantle; Burnie; Brisbane. at CFS Cotton Avenue).

	(3)	(4)	(5)
	Kanika/	Brisbane; Sydney; Melbourne; New Castle; Adelaide; Fremantle; Auckland; Wellington; Lyttleton. (Carting at Timber Pond No. 3).	
	Silver Ship	Sydney; Melbourne; Brisbane; Adelaide; Fremantle; Auckland; Wellington; Lyttelton; Chalmars. (Carting at T.P. No. 3).	
n)	Unimarine	Dammam.	31/1
ever	Parekh/	Muscat; Dubai; Sharjah; Abu Dhabi; Bahrain; Dammam; Kuwait; Baghdad. (Carting at Hay Bunder No. 4).	4/2
	Merzario/	Dubai; Sharjah; Abu Dhabi; Muscat; Doha; Dammam; Kuwait; Bahrain. (Carting at 14-VD for Merzario).	
	L. Triest/	Dubai; Dammasn; Riyadh; Muscat; Abu Dhabi; Doha; Kuwait; Bahrain. (Carting at 171/173 Cotton Depot for L. Triest).	
	Seaspeed	Dubai; Dammasn; Bahrain; Kuwait; Doha. (Carting at H.B. No. 5).	

VESSELS DUE IN BOMBAY FOR IMPORT DISCHARGE

er's Name	Agents	From
Duke	Patvolk	U.S.A.
ogress	I.S.S. Co.	U.K. Cont.
Mutyara	Mackintosh	China/F. East
k	Depe	Far East
ky Pioner	Transocean/I.S.S.Co.	U.K. Cont.
as Star	L. Triest/Hindustan	Med. Ports.
adhya Pradesh	S.C.I.	Med. Ports.
ouston	M.S.P.L.	U.S.A.

ATTENTION ALL READERS

ASE LET US KNOW WHAT NEW FEATURES YOU
JLD LIKE US TO INCORPORATE OR WHICH FEA-
ES YOU FIND REDUNDANT. YOUR PROMPT
LY WILL BE HIGHLY APPRECIATED.

Address all letters to
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Bombay 400 031

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- 1,3,5 Trimethoxy Benzene
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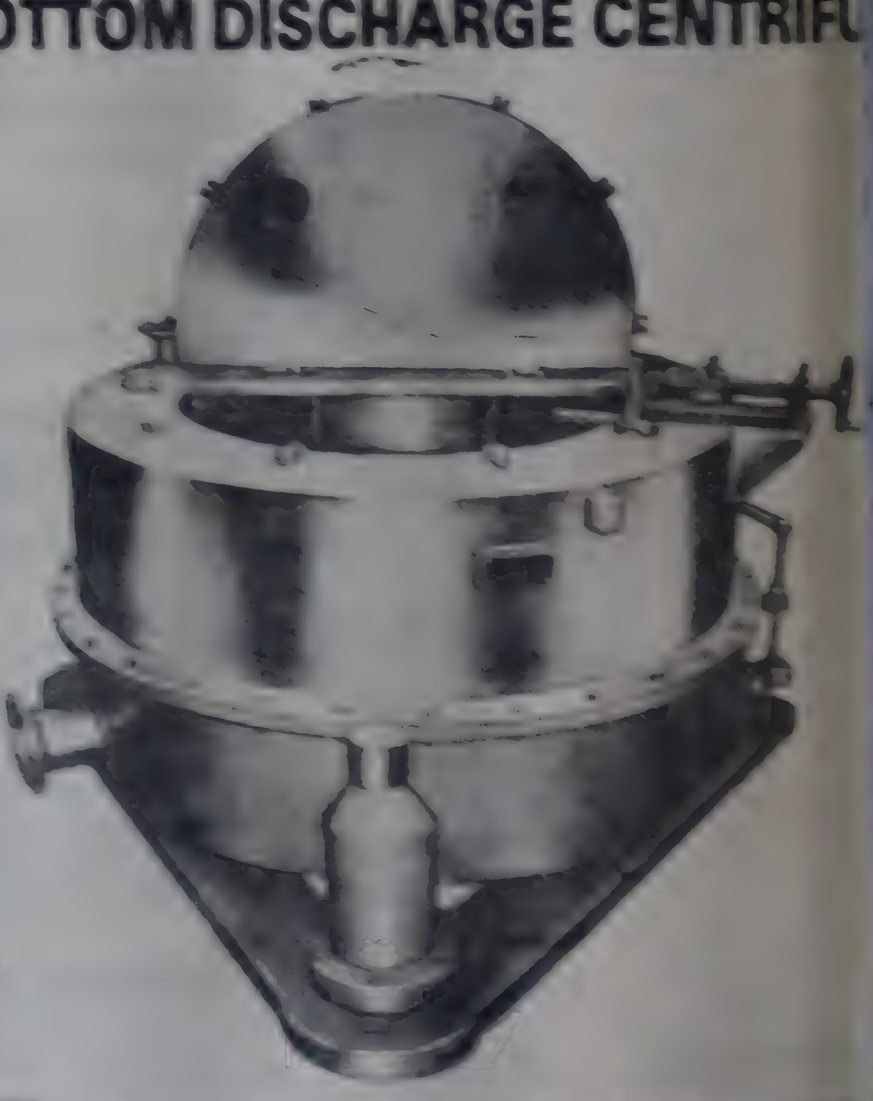

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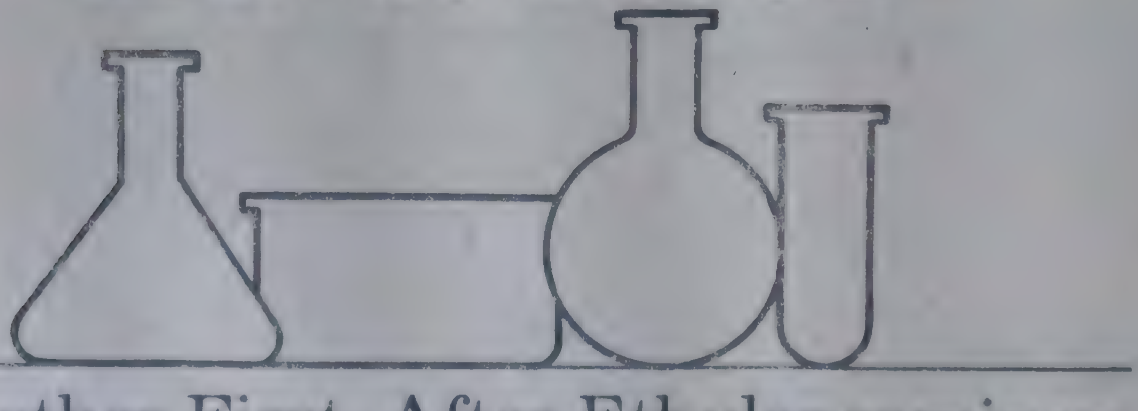

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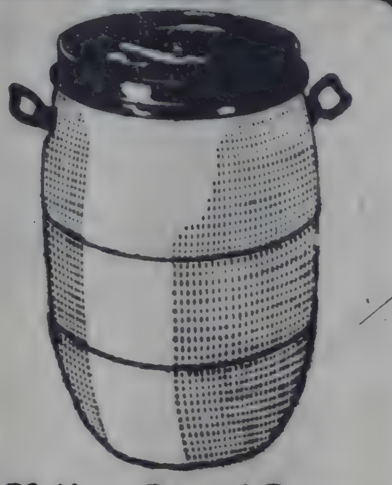

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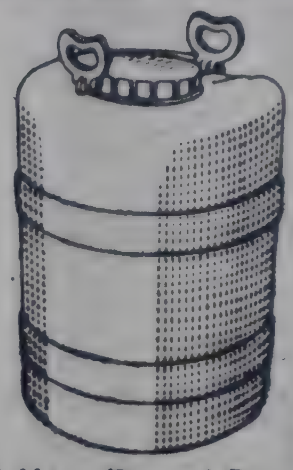

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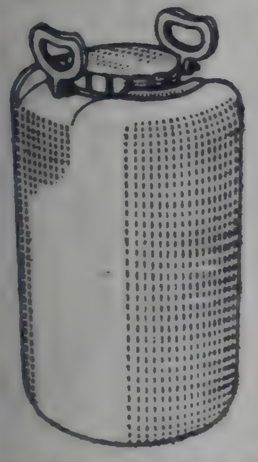
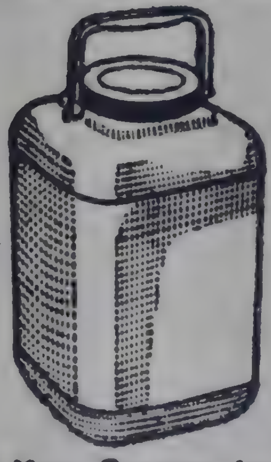
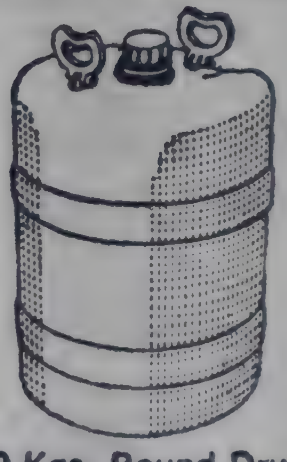


30 Kgs. Round Jar
– 6" Cap

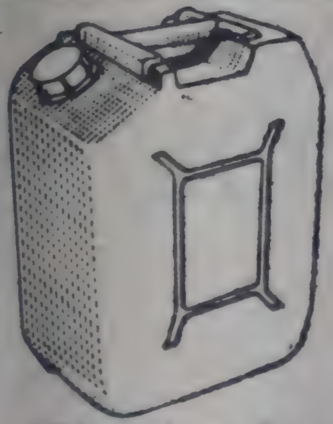
20 Kgs. Round Jar
– 6" Cap



6 Kgs. Square Jar
– 4" Cap



50 Kgs. Round Drum
– 2" Cap



30 Ltrs. Jerry Can
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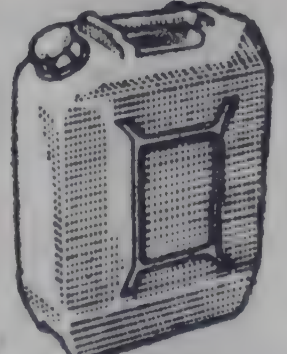
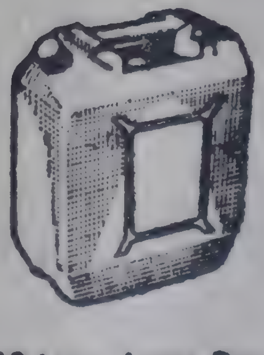


20 Ltrs. Jerry Can
Stackable



10 Ltrs. Jerry Can
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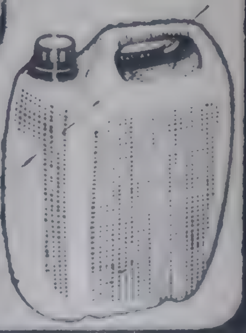

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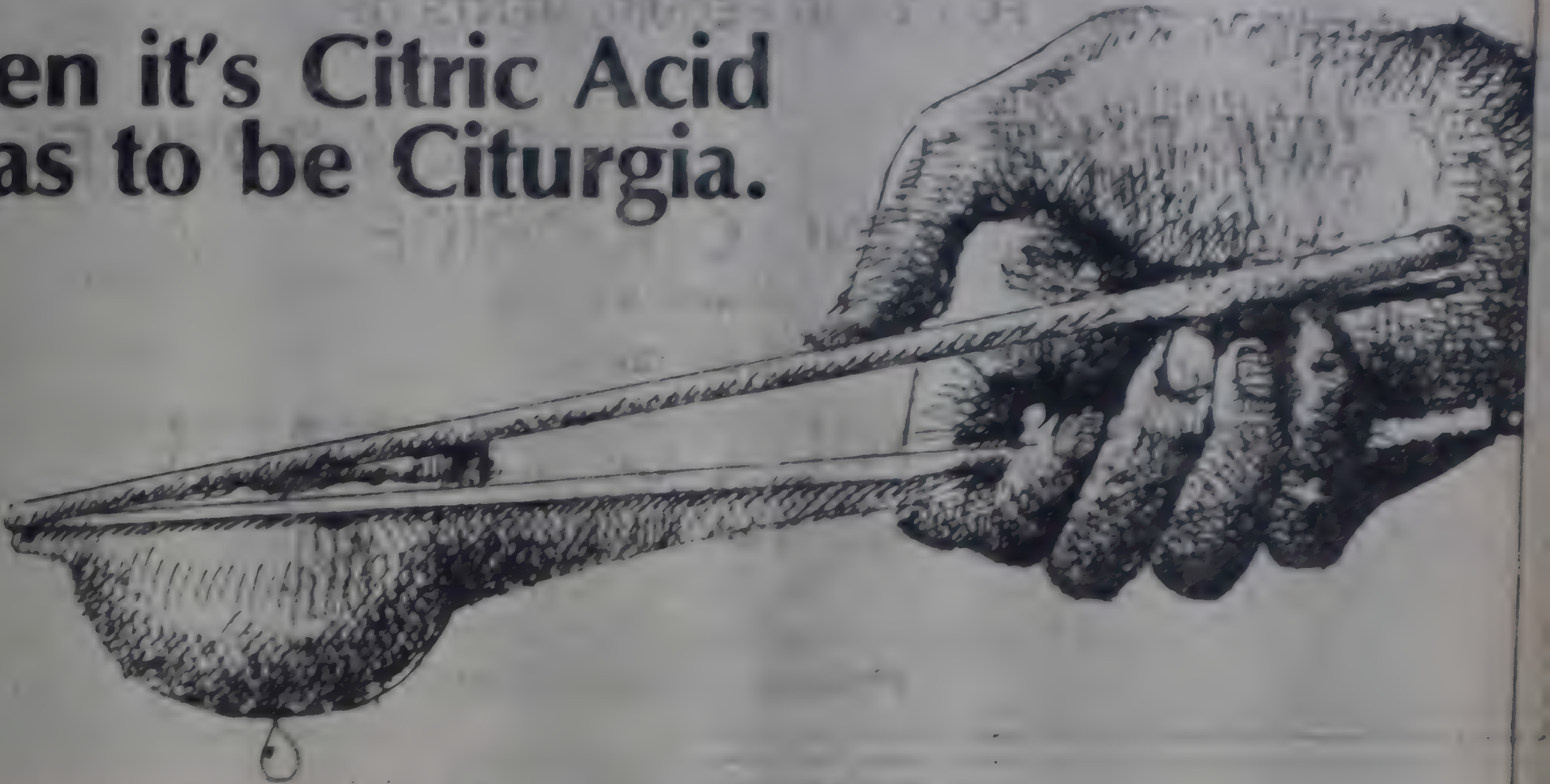

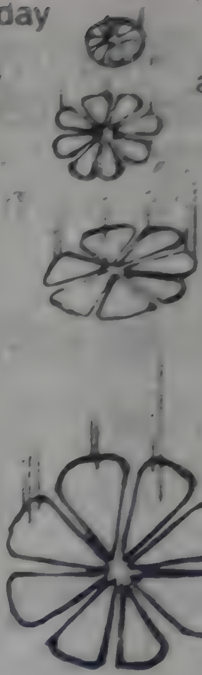

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CHEMICAL WEEKLY

VOL. XXXV DECEMBER 19, 1989 NO. 15

HERALDING THE 21st CENTURY - 32

Future belongs to the Physicist and Molecular Biologist

ere will science and technology be heading between now nd the dawn of the 21st century? All indications are that est advances over the next 15 years or so will come in two – physics and molecular biology — as scientists work to r the remaining mysteries of the atom and the gene. The roughs will take place both in the abstract world of theory he concrete achievements of sophisticated machines. They supercomputers that can simulate the turbulent impact of eam, exotic microscopes that let scientists see actual atoms, v tabletop instruments that speed the mapping of DNA, the stepladder molecule that holds the key to heredity.

ractical consequences of much of the forthcoming research ost unimaginable. Burton Richter, Director of the Stanford Accelerator Center in Menlo Park, California, one of the most productive atom smashers, speculates that if scient- d a particle called a free quark, it could be used to make ly powerful rockets. He also suggests that discovery of the particle of magnetism, the monopole, would make possible that could propel magnetic flying cars. It is the quickening of the understanding of living nature, that many scientists will yield the most spectacular advances in knowledge —as the best investment opportunities in technology.

rt Fildes, President of Cetus Corp., a leading biotech firm ryville, California, says he is buoyed by such sucesses as genetically engineered Interleukin-2, or IL-2, which con- c show encouraging results in treating even terminally ill victims. Fildes and his colleagues envision dozens of sub- ike it coming to market; they will mobilize the immune o fight disease. For basic scientists, whose work fuels the of innovation and economic payoff, what's exciting today we're getting closer to the high technology of nature.

e these efforts are still primitive, man made microcircuits inning to home in on the kind of elaborate circuitry that evo- has produced in the human brain. One used to think one is very well when one wired up a computer made of circuits ntain a few hundred thousand transistors on a single chip. Then when one looks at a piece of human brain tissue the size of a chip and one finds there are the equivalent of several hundred million transistors in it. Penzias shared a Nobel Prize with a colleague, Robert W. Wilson, for detecting the remnants of the radiation left over from the Big Bang that got the universe started. Though he was trained as an astrophysicist, Penzias sees biology as the next big treasure trove to be exploited for ideas and products. These will range all the way from semiconductor memory chips whose structure mimics that of the nerve cells, or neurons, to understanding how a South American wasp with only 300 neurons in its brain unerringly locates the single species of spider its young will feed on, or how the information required to sprout and grow into a plant is packaged inside a green pea.

The recognition that biology is the next big frontier is universal. Japan has proposed a "human frontiers" initiative, a gigantic worldwide scientific cooperative program in the biological sciences. The proposal has two phases. The first lasting ten to 15 years, would scrutinize the origins of living organisms in great detail. The second would try to put living organisms to use as economic tools. For example, genes that allow microorganisms to survive extremes of temperature could be pinpointed, copied, and implanted into a microbe used in producing plastics. The goal is to redesign living organisms for use in technologies as diverse as biotechnology, medicine, materials science, and computers.

Computer science is moving toward trying to copy biological systems because the brain is far more efficient than any computer in memory capacity, data retrieval, and information processing. Bell Labs scientists have already built several experimental memory chips based on the structure of the neuron of the common garden snail. Carver Mead, a noted Caltech microchip circuitry researcher, believes that science is at a unique point in history because the silicon that chips are made of is the first medium that allows biological style information processing to be imitated accurately and inexpensively in hardware. He says that "probably in ten years we'll see simple neural systems on the market" - silicon systems used in toys, computers, and accessories — that will see, hear, feel, and remember in ways far superior to anything that exists today.

Mead has succeeded in imitating some of the information-processing capability of the human eye on a silicon chip. His chip is a big leap beyond existing machine vision systems because it tracks motion more efficiently. Conventional systems are bulky, involving TV cameras and boxes containing auxiliary computing power. Mead's chip needs no camera. It uses only a magnifying lens, and tracks motion as simply and elegantly as the human eye. Mead is employing a similar approach to imitate other sensory organs. He has also built a "cochlea on a chip"- the cochlea is the coiled tube in the inner ear that receives sounds - as a first step toward a system that would process spoken computer commands reliably and cheaply.

Further in the future may be chips actually composed of biological molecules. That feat could boost the information-storing capacity of a chip a billion fold. Although most scientists doubt that biological chips can be made, a team of Japanese researchers at Ajinomoto Co. in Tokyo may have taken the first step in that direction recently by using a pigment secreted by a bacterium to create a switching device — basically what a transistor is. The Japanese researchers suggest that bacterial rhodopsin, similar to the visual pigment that translates sights into electrical signals in the human eye, could serve as the starting material for this type of biochip.

On top of that is parallel processing itself, which is the great new wave in computing. It is a large-scale attempt to link up many computers to imitate the parallel structures and functioning of neuranal networks in the brain, where a great number of cells process problems and images simultaneously.

Equally exciting are the opportunities for the new biology in the prediction and prevention of disease. Now on the horizon is the awesome possibility of deciphering the sequence of all of the roughly 100,000 genes in man. This mapping job should be well be along a decade from now, Mapping the genes would allow scientists to discover, "how the human computer is put together."

Once the order in which the genes appear is known, their functions will become clearer and the malfunctions that cause disease could become easier to correct. Locating genes precisely and ascertaining their exact purposes should help shed new light on the nature of major killers such as cancer and heart disease, to a bonanza for companies that stay on top of developments in bilotechnology. Decoding man's molecular anatomy will be greatly speeded by "gene machines" invented by Hood, which allow researchers to determine the order in which the components that make up the genes occur and to reproduce them.

The consequences of deciphering man's genetic alphabet would be an epoch making outcome. "Mapping the human collection of genes should allow people to take their genetic makeup into account in living their lives—and not learn the hard way."

Hood sees the need for gene machines that work ten to 100 times faster than his does. Depending on the size of the effort, the total genetic alphabet may be laid bare by the year 2000. Once that happens, other vast new opportunities will open for drugmakers. The immune system and the brain would become accessible to new wonder drugs that could treat such now intractable diseases as Alzheimer's and schizophrenia.

The excitement on the frontier of physics equals that in th
sciences. From the search for new elementary particles, for ins
may come ways of producing energy in amounts that seem in
prehensible today. Leon M. Lederman, Director of the F
National Accelerator Laboratory in Batavia, Illinois, says the s
of those particles hints at the existence of natural processes that c
liberate virtually all of the energy in a fuel. Even nuclear fis
which releases about four million times as much energy per
of fuel as burning coal or oil, frees less than 0.1% of the en
in an atom of uranium or plutonium. If scientists could find a
to release all the energy in a common substance like water, l
erman says, the world's annual fuel requirements could be met
a few tons of it.

Heavy ions could be fired at each other so they would col
and release massive amounts of energy. Heavy ions, atoms that h
lost an electron, are created inside an accelerator. They are alre
used to make short-lived radioactive isotopes; one of them, io
123, was given to more than a million people around the worl
diagnose thyroid cancer. Among the companies that make it are B
edict Nuclear Pharmaceuticals of Golden, Colorado, and Medi Ph
ics of Emeryville, California. Heavy ions can also generate
alloys that D. Allan Bromley, a noted Yale physics professor, s
would allow industrial operations at higher temperatures with
destroying parts of the system due to heat. Bromley calculates
each degree Fahrenheit increase would result in savings of $1
lion a year because industrial processes would no longer be limi
by the failure at high heat of some material somewhere in
system.

Within the next five to ten years, physicists hope to make E
stein's dream come true by devising a theory that would unify
four known forces of nature into a single whole through a sin
set of equations and concepts. Two of the forces, electromagneti
and gravity, have long been familiar. The other two, the so-cal
strong force, which holds the nucleus of the atom together, and
weak force, which is responsible for many types of radioactivi
were identified in the 1930s.

If the past is any guide, the consequences of the unification
those forces will be immense. Consider the effects of unifying el
tricity and magnetism in one theory, the prodigious intellectual f
performed by James Clerk Maxwell in the 19th Century. Bef
Maxwell, electricity and magnetism were viewed as separate forc
When Maxwell unified them, he created much of the foundati
of modern physics — and modern life. In physics, Maxwell's wo
underpins the understanding of electromagnetic phenomena ran
ing from waves to plasmas, superhot ionized gases that can for
jets of staggering sizes in outer space. It also helped answer su
questions as why air is transparent and what holds the sun and t
stars together. As for life and commerce, electromagnetic theo
made possible the invention of radio, television, computers, and rad
— and the creation of vast modern industrial power networks a
communications systems. Even more remarkable inventions are
the way, and the economy — as well as society as a whole —
be the beneficiary.

— T.P.S. RAJA

(Condensed from an article by Gene Bylinsky entitled "What Tom
row Holds" -- *Fortune*, October 1986).

HEMARENA

VENKITESWARAN

"Engineering" Plastics

major developments now is on plastics for engine-
nd speciality applications and there are no new pol-
which have hit the market. The penetration of plastics
lications such as packaging has been deep and there
a large area of applications as substitutes for metals
extent that performance at higher temperature are not
ed. The speciality polymers seek to advance the areas
ge by higher temperature tolerance and cost reductions.
f total market of plastics is cornered by the four majors
yethylenes, polypropylene, polystyrenes and PVC —all
at below $2 per kgm. and with the improved grades
se they have reached maturity. Hence the concentra-
n high performance materials which sell at $2 to 5 per
Such materials are obtained by modifications using fil-
nd reinforcements or by alloying and blending of the
ers. A brief review in the *Chemical Business* focuses
present status.

engineering polymers (EP) are polyamides (PA-
s), polyacetals (POM), polycarbonate (PC), polyphen-
oxide (PPO) and polyesters, the big five. These have
trength/stiffness and heat resistance, some with better
cal properties and flame resistance. Polymers of the
st performance and a resistance to say 200°C are very
riced. The smaller volume polymers of higher perform-
han the big five are polyarylate PAR, polysulfone PSU,
her sulfone PAS, polyetherimide PEI, polyphenylene
PPS, liquid crystal polymers LCP, fluoropolymers FP,
ide PI, and polyether ketone PEK. But the overall use
these is only 34,000 ton/year as against nearly 2 mil-
nnes of the big five.

top firms with their share of markets are —

eneral Electric Plastics	— 5,00,000 tonnes
oechst	— 3,40,000 tonnes
ayer	— 2,20,000 tonnes
uPont	— 2,10,000 tonnes
ASF	— 1,70,000 tonnes

mentioned earlier the overall market is in the region
nillion tonnes or 3% of the total market of 70 million
. Polyamide or nylons are the largest in volume and
are too many producers. Polycarbonate is the next and
more readily alloyed with other polymers like PVC,
PBT etc. to get products of lower prices. The sectorwise end use pattern of EPs are estimated at —

Transportation	— 5,35,000 tonnes
Electrical/Electronics	— 4,30,000 tonnes
Machinery & industrial	— 2,25,000 tonnes
Consumer & recreation	— 2,25,000 tonnes
Sheet and film	— 2,00,000 tonnes
Appliances and power tools	— 1,50,000 tonnes
Monofilaments	— 28,000 tonnes
Others	— 1,87,000 tonnes

There is already excess capacity and too many producers for some like nylons and polycarbonate and polyacetals. The capacity utilisation is said to average 70 to 80% but with wide variations. Even new countries have taken to the engineering plastics —Brazil, Korea, Taiwan and India will also get into the race in due course. PPS is said to be the most affected by overcapacity — 22,000 tonnes with a market of only 14,000 tonnes and plans for doubling of capacities to make the situation worse. The most specialised polymers are the LCPs with market of 300 tonnes but also with 20 suppliers and of PEK with market of 350 tonnes. The LCP or liquid crystal polymers have properties of liquids-viscosity and of crystals-anisotropy and are special for electroncis area. The aromatic polyether ketones are a new class which have emerged and have a new series of application for autos and electricals due to very good hydrolysis resistance. The most important of recent polymers are those for use in fibre optic cables. The developments here have been dynamic and polymethyl methacrylate has emerged as a competitor to quartz for optical fibres.

In India IPCL have a joint venture with the world leader General Electrics for engineering plastics which is getting organised Nylon the original material for engineering uses is already produced to a small extent while polyacetal has been on the anvil with programmes of several parties making little progress. In the area of polyamides for engineering applications the developments are many — with fibre reinforced materials, nylon/ABS alloys, nylon 12, a new nylon 46, of DSM, nylon/HDPE alloys, all with better properties and higher temperature resistance. DuPont's super tough nylon Zytel ST is a blend of nylon 66 and EPDM. Composites with Kevlar (polyaramide) are also available. It is appropriate that polyaramides dominate the engineering plastics market and it is an area of opportunity.

Petrochemicals in Latin America

Interesting information on the capacities for various petrochemicals in the Latin American countries (which have been planning an overall Latin America Petrochemical programme based on raw materials available in countries like Mexico, Brazil, Venezuela, as on beginning 1989, is detailed in a recent issue of Chemical Week. This is reproduced below

and may be of guidance in respect of dec
ance and volume of different products
jections. We cannot afford to repeat s
such as the lower priorities to HDPE and
imports even now, as also on the vexe
mum economic capacities.

PETROCHEMICAL CAPACITIES IN LATIN AMERICA

Item	Brazil	Mexico	Argentina	Venezuela	Colu
Ethylene	1435	1432	255	150	12
Benzene	613	398	380	—	4
B-tadiene	267	55	33	—	—
Xylenes	400	746	—	—	4
LDPE	640	259	227	60	5
HDPE	260	100	62	60	—
PP	175	123	57	40	4
PVC	606	301	129	42	13
Styrene	290	180	54	—	—
VC Monomer	325	270	68	54	1
Acetaldehyde (from ethylene)	131	144	—	—	—
Acetic acid	230	277	29	3	4
Octanol	88	—	—	—	—
Acetone	64	91	13	—	—
Phenol	102	28	—	—	—
Propylene oxide	90	—	—	—	—
Ethylene oxide	140	228	—	—	—
Acrylonitrile	72	124	—	—	—
P.T.A.	90	270	—	—	—

"Spectra" -- High Strength Fibre

Allied Signal's technical center has come up with a super-strong fibre for innovative protective clothing and other special applications. Termed "Spectra" this is 30 to 40% stronger on weight basis than even DuPont's Kevlar aramid and is not aromatic based. It is equal in strength to Kevlar on a volume basis. The products developed from spectra include glove liners to protect health care workers from exposure to infection, cut-resistant industrial gloves, leg caps, bullet resistant vests etc. besides protective helmets. The glove liners can be sterilised and is extremely light so that it is very comfortable. Another type of glove for use by butchers or other group of industrial workers is also developed. A single edge razor blade cannot penetrate and it is 30% lighter than Kevlar gloves. Spectra based bullet proof vests are about a quarter inch thick.

Spectra is based on the crystalline and
yethylene chain. The orientation along
rise to high tensile strength and mod
weight is in the range of 1 to 5 millior
conventional. The polymer has to be spe
vent that disentangles the polymer chain
cous gel. The fibre is liberated from th
and extraction and further drawn for furth
tra melts at 147°C which is high enough f

The fibre is also chemically inert b
and therefore whitish. But being knitted
ture threats. Spectra can also be used
and moulded into rigid forms such as
crash helmets.

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GAS, PETROLEUM PRODUCTS

Pipeline network on cards

The Petroleum and Chemicals Minister, Mr. M.S. Gurupadasway, has said the Government would create an effective network of pipelines all over the country for economically transporting natural gas and petroleum products without affecting other vital sectors of the economy.

The Government would take a "very objective view" about laying more pipelines which were capital-intensive. In the long run these proved economical and efficient for transporting natural gas and petroleum products, he said. The Minister, who was inaugurating a three-day international conference on 'Petroleum pipeline technology', organised by the Indian Oil Corporation at New Delhi on December 14, referred to the recent significant gas strike in offshore Kutch and the vast potential of natural gas in other parts of the country.

Pollution of the atmosphere was a serious problem being faced by several nations including India. To tackle the problem, the pipelines for carrying petroleum products would be helpful, he added.

Mr. Gurupadaswamy said India had to strive for a strategic balance between various modes of transport rail, road and pipelines for transporting petroleum products from one place to another as the country was vast, had a variety of terrains and faced natural calamities.

Therefore, based on socio-techno-economic considerations, we will have to adopt an appropriate mix of various modes of transporting products.

In view of the importance of the pipelines, the Government was committed to upgrade pipeline technology, he said. The Indian Oil Corporation Chairman, Mr. S.L. Khosla, said it was proposed to increase refining capacity in the country by 36 million tonnes annually in the next ten years to keep imports of petroleum products at a reasonable level.

In his keynote address at the conferent, Mr. Khosla said annual consumption of petroleum products in the country was now about 53 million tonnes. It would go up to about 101 million tonnes annually by the end of the next decade, he added.

Light and middle distillates accounted for 78 per cent and would increase to 82 per cent in another ten years, he said. Expert bodies constituted by the Planning Commission had come to the conclusion that when significant quantities of petroleum products were transported, pipelines would be more efficient and economical. Therefore, pipelines should be preferred for this purpose, Mr. Khosla said quoting the experts.

FIRST PRIVATE SECTOR COMPANY TO EXPLORE GAS

Hindustan Oil Exploration Corporation Ltd. (HOEC) expects to be the first private sector company to carry out the exploration of hydrocarbons. It is therefore raising Rs. 7 crores from the Indian public and NRIs and another Rs. 3 crores from private placement. (A brief report appears elsewhere).

Mr. H.T. Parekh, Vice-Chairman, said the company had received clear indications from the new Government that it would allow an exploration licence. He said ONGC had earlier rejected its proposal. HOEC has "reached an understanding" with Oil India Ltd. to jointly explore any new areas which OIL enters, he added.

It has also signed a letter of intent with International Petroleum Ltd. to take a 10-per cent share in its block, Krishna Godavari offshore-four. It will share in the benefits should gas or oil be struck,
HOEC's 10 per cent share w
chased at a premium, of arour
crores. FERA clearance for the
exchange outgo is expect
observed.

HOEC has applied to the
Government for a petroleum exp
licence in the Kutch Basin. Th
posal to prospect in this area o
8,000 sq.km. has been forwarde
Union Government. The comp
also likely to participate in roun
of the auction of offshore bloc

Mr. Ajit Kapadia, HOEC Ma
Director, said the company had f
a joint venture with Prakla Seism
of West Germany to undertake, in
all aspects of geophysical data a
tion and interpretation.

Further HOEC has invested
cent in the equity of Gujarat Gas
pany jointly promoted by Mafatla
and GIIC, to distribute natural
Gujarat to industrial, commercia
domestic consumers.

The company has also set up
age oilfield services, with technica
laboration from Mountain Well Se
of Canada, to provide facilities in
over drilling, short hole drilling,
logging and so on. The company
enter the market in early February

Banks and institutions would pr
underwriting for Rs. 8 crores, inclu
contingent underwriting of Rs. 3 c
Brokers would underwrite another
crores of the public issue.

SPCL PACT WITH US FIRM

Sumitra Pharmaceuticals and Ch
icals Limited (SPCL) has recently
cluded an MoU with a New Jers
based firm Techno Chem Inc.,
exclusively marketing its bulk ibupr
in US. The American firm will
assist SPCL in getting approval f
US-FDA.

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O.P. KHARBANDA

FRANKLY SPEAKING

Dr. O.P. KHARBANDA, Cost & Management Consultant,
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Life Starts After Retirement

I am 65 and have already retired (more correctly 'retired') thrice. FIRST occasion was in 1964, when after some ten years with a British Company (two years in UK and eight years in India), I was told that the company did no longer require my services. I was a director-designate of the Indian company then, under formation, and my fault lay in telling the 'colonial' boss that he was wrong in appointing a committee to look after the affairs of the company in his absence on home leave. It was better to name one person (not myself) in-charge of the day-to-day affairs, and department heads to look after their functions.

NEXT 'retirement' was in 1976, when after 12 years service with a major Indian engineering company started by two Danes, I was found to be 'too good' for them. And this happened a day before the chairman was due to go to Manila to receive the Magsassay award, whose citation included, 'human concern'. In doing this 'dirty' job, the worthy chairman was obliging his then President, hoping that as a result he himself would not be 'retired'. But alas that was not to be, since the chairman himself was 'retired' rather unceremoniously, and that too, rather significantly on the date of my 'retirement'. Honestly, I felt more sorry for him than for myself, particularly since I used to work directly with the chairman and all these years the then president had always proclaimed publicly that he considered the chairman as his 'father' and in fact he owed to him all that he knew! And yet one fine morning, the 'son' showed his 'father' the way out.

That's life, real life, crude life, dirty life! Needless to say that I was not even given a 'burial' at these two 'retirements',
let alone a fitting one. Even the simple co
was denied. How mean can you get? The T
came in end 1988 at IIT, Bombay, when I o
visiting professorship. Refreshingly, this wa
and I was given a moving farewell and ev
which I cherish most heartily — a year I e
in the company of bright students, introduc
ses in two departments. The greener surro
library facilities and a clean swimming po
attractions for us. Truly, a landmark in

Let me revert to my SECOND 'retirem
enough, 2-3 years before this event, I had as
but was considered too indispensable. Fla
only to be de-flattered! I had joined this
ager of a division previously looked after
was not considered fit enough to head the
suddenly catapulated to the newly creat
virtue of being 'son of the soil'. And al
became my boss! Good for him. But I t
assignments, first heading one of their th
haps the most profitable division, then fou
sions including the nuclear, turnkey an
Finally I was 'dumped' into Planning
Department, and one of my functions her
and 'educate' my boss who was brought in
is when I asked to be relieved, but the t
haps felt that would be far too honourabl
back I have no regrets, only wish I had
concentrate doing what I like most — w
for fun and consulting for 'bread and bu
very lucky — generally! The president, o
as chairman after he 'retired' his 'father'
repeated in 1989, when a family house
company through devious means. One of
new chairman was to announce a fitting '
going chairman on a date convenient t
injury to insult, at the AGM he shed 'cro
ting that his predecessor deserved bette
fully, he did not say, by whom!

Dr. Kharbanda, a Fellow of the Institution of Chemical Engineers, is a visiting professor and an author of repute. His recent title: CAPITAL COST ESTIMATING IN THE PROCESS INDUSTRIES, (Butterworth, 1988). Forthcoming titles: (All with Mr. E.A. Stallworthy) WASTE MANAGEMENT — TOWARDS A SUSTAINABLE SOCIETY (Gower, 1990) & PROJECT TEAMS — THE HUMAN ELEMENT (NTL. COMPUTING CENTRE, 1990). Available from Vivek Enterprises, 5, S.K. Barodawala Marg, Bombay 400 026.

ALCOHOL

SC disallows levies by states

eme Court on October 25
he curtain on a long era of
hegemony over industrial
retching back to pre-
e days.

mmentary on Indian bureau-
ll the levies knocked down
as unconstitutional continue
d. The local bodies as well
llectors have not been offi-
about the judgement. The
ernment, which was a party
se, has promised to send
s to all States after studying
nent.

y implementation is in the
all parties, because all the
collected as imposts after
will have to be returned. The
ruled that the States have the
o charge only a regulatory fee
and regulating permits as a
uo on the basis of reimburse-
actual expenses or costs

arashtra, the Excise Depart-
ready collecting establishment
or the staff engaged in this
as such the question of charg-
eparate fee does not arise. As
ment is prospective, actual
n made by the States prior to
ment are protected.

verse State levies on alcohol
e scrapped following the
and chances are that the ethyl
or control order of the Union
ent will be enforced. This will
more or less uniform price
t the country, making allow-
r transportation costs. The
e barriers erected by export and
ees will also go.

udgement thus brings promise
al to sick alcohol-based units in
ke West Bengal and Karnataka
which were deprived of their feedstock all these years, despite a glut in alcohol-producing neighbouring States like Uttar Pradesh and Maharashtra. Alcohol-based industry could hitherto flourish only in Uttar Pradesh, Maharashtra and Tamil Nadu. For this reason, industrial promotion agenices and financial institutions used to dissuade setting up of alcohol-based units in other States.

The judges sprang a surprise by disallowing States to levy sales tax as well. The court ruled that after the 1956 amendment to the Industries (Development and Regulation) Act, empowering the Union Government to control fermentation industry, "the State may charge excise duty on potable alcohol and sales tax... However, sales tax cannot be charged on industrial alcohol... because under the ethyl alcohol
price control order, sales tax cannot b
charged by the State on industrial alco
hol." The State's power, in other words
would be reduced to that of mere admin
istration.

The judgement should also hopefully pave the way for technological upgradation of alcohol-based chemical industry. While petrochemical industry i keeping abreast of the advances on the global scene, the alcohol industry has been following obsolete technologies in isolation, beginning with poor fermentation yields in distilleries, excessive consumption of utilities, poor productivity and a lack of concern for effluent treatment.

A few units which sought to improve technology found that the advantages were neutralised by the high imports levied in their States. Obsolete technologies fetched better returns in States where the levies were minimal. Apart from the levies, some States have been

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DRUG FOR LEUCODERMA

Cuban, Indian firms sign MoU

Cuba will collaborate with a private Indian firm to set up a plant to manufacture medicine for treating leucoderma. A memorandum of understanding for the collaboration was recently signed by Centro De Histoterapia Placentaria of Havana and the Indian firm, the Centre director, Dr. Carles M. Myiares Cao, said.

Dr. Cao said intensive research at the centre had helped scientists find a new substance known as "melagenina" in the human placenta to cure leucoderma (also known as vitiligo) which has been treated with a group of chemicals extracted from vegetables known as psoralenes. These chemicals are now produced synthetically and were used topically or administered orally together with exposure to sunlight, he said, adding that the results of this treatment were unsatisfactory. They also had adverse side effects like burns, gastritis, hepatotoxicity, carcinogenicity.

He said "malagenina" had been extracted from the human placenta and had not shown any side effect on leucoderma patients so far.

Dr. Cao said it had not yet been categorically determined whether victims of vitiligo (leucoderma) developed any alteration in their neurocrine or immune systems, which might explain the correlation between the mental condition and the depigmentation of the skin which takes place as an immediate consequence.

He said melagenina is an alcoholic extract obtained from the placentas of healthy women under aseptic conditions. The extract contains a lipoprotein of molecular weight ranging from 1500 to 4000 daltons. This substance stimulates the reproduction of the melanocytes and the synthesis of melanic pigment. It also accelerates the oxidation of the aminoacid 1-DOPA in the presence of sunlight and quickens its transformation into melanin, he said.

He said placentas are kept frozen for several days, after which they are ground and treated by organic solvents to separate active pigmentation principals from other components. Once the melagenina is obtained, it is dissolved in ethanol and bottled in amber containers, he said.

Dr. Cao said one placenta could provide 20 bottles, each containing 235 ml of melagenina lotion. Dr. Cao said about one per cent of the Cuban population was affected by leucoderma, while in India, about three per cent of the population suffered from this disease.

Dr. S.K. Sharma, executive vice-president of the Indian firm, said the production of melagenina in India would lower the cost of melagenina from Rs. 256 per bottle, which includes import duty, excise and customs and other taxes and expenses. He said they had so far imported 20,000 bottles of melagenina lotion.

Mr. Sharma said they also planned to export the drug to neighbouring countries and to West Asia. Dr. Cao and Mr. Sharma said about 84 per cent of the patients, who used the lotion had been fully cured.

NO NEED TO CHANGE PATENTS ACT

The Indian Patents Act, 1970, continues to represent Indian interests and requires no amendments. This was one of the resolutions adopted at the National Conference of Scientists on Science, Technology and Patents which was held in New Delhi recently. The conference also said that the Union Government should not give into demands for discussing patents at any of the international trade fora such as GATT.

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The conference noted the
patents system had made
research, resulting in a
unhealthy practices driven
commercial considerations in
countries.

The Government has been
update and expand the Con
Patents Organisation so that it
tinise the patents applications
the country better. This will als
it to give proper guidance to
and technocrats while filing app
for patents.

DSIR AWARDS FOR NIN
COMPANIES

The Department of Scien
Industrial Research (DSI
announced national awards
companies for research and
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official release said.

The companies are Garwar
and Polyester Limited, Bomb
baxy Laboratories, New Delh
Heavy Electrical, Bhopal, Wip
mation Technology, Bangalore
Communications and Ele
Baroda, Larsen and Toubro
Steel Authority of India Ltd.
Maharashtra Hybrid See
Bombay, Lupin Labs., Bomba
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In order to provide recog
efforts of the industry towa
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instituted by DSIR in 198

ers price spurt hits plastic units

d sharp increase in the ners has hit the plastic Prices of polymers were ng May-September 1989 d firmness prevailing 9. However, a blast at t Passedena in Texas, o have changed the price

polymer producers in the ddenly stopped offering antity and have started According to Mr. Vijay esident of the All-India ufacturers' Association, eks they have increased ggering 30 to 35 per cent HDPE, 25 to 30 per cent nd 20 per cent for poly-

plant has the production 30 lakh tonnes, which is ne per cent of the total world installed capacity of 830 lakh tonnes of polymers. Mr. Merchant has expressed surprise as to how such a minor change in supply of polymers could have such an impact on its prices.

The plastic industry in the country gets half of its raw material requirement from indigenous producers and for the other half it has to depend on overseas supply. "Even local producers are making units to wait in queues for percentage allocation of quotas, with some grades not available each month", he said.

PLEA TO PERMIT DUTY-FREE IMPORT OF CAPITAL GOODS

The Chairman of the Engineering Export Promotion Council (EEPC), M.C. Shah urged the Prime Minister, Mr. V.P. Singh to allow duty-free import of capital goods which were neither indigenously manufactured nor available in the country, to help meet the challenges on the export front. A scheme providing for this should be tied to suitable export obligations, backed by a bank guarantee on the lines of the existing "advance licence scheme" for import of raw materials for export-production, Mr. Shah said in a statement released at Madras.

Congratulating Mr. Singh on his becoming Prime Minister, Mr. Shah said in view of the challenges thrown up by the EEC unification by 1992 and the deteriorating foreign exchange situation of the developing countries, the need for technology upgradation and expansion of capacities to achieve "the economies of scale" could not be overlooked. Mr. Shah expressed the hope that Mr. V.P. Singh would not only allow existing incentive schemes and policies to continue, but also introduce new measures which were very vital for increasing exports.

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MGCC expansion may be hit

Even while a high-power team has gone to Washington to negotiate a loan from the World Bank for the expansion of the Maharashtra Gas Cracker Complex (MGCC) at Nagothane, the project is likely to be jeopardised by the conditional clearance granted to it by the Ministry of Environment and Forests.

The approval letter issued recently to Indian Petrochemicals Corporation Limited (IPCL) — the implementing agency for the project has stipulated, among other things, that the supply of feedstock should be arranged from any other sources other than the Uran terminal facility of the Oil and Natural Gas Commission (ONGC). This is because ONGC has already given an undertaking to the Ministry that it would not expand or undertake any additional activity at its facility at Uran.

This stringent condition imposed by the Environment Ministry has taken the Department of Chemicals and Petrochemicals completely by surprise. According to sources, the Department which is now under the Ministry of Petroleum and Chemicals took up the matter with the clearing Ministry and a fresh dialogue on the issue is now on. As such, the Uran terminal of ONGC is the only facility that could supply the additional feedstock necessary for the MGCC expansion.

As of now, gas, which is the basic raw material for cracker complexes, is to be supplied to the present units by ONGC from its Uran terminal through pipelines. Bharat Petroleum and Chemicals Ltd. (BPCL) is the other supplier which is to deliver ethane/propane (C2,C3) streams or lean gas from Thal-Vaishet, also through pipelines.

The environmental clearance for the MGCC expansion project pertains to the increase in the capacity of the gas cracker to manufacture four lakh tonnes of ethylene instead of three lakh tonnes per annum, of the high density polyethylene (HDPE) unit to 75,000 tonnes per annum, of the linear low density polyethylene (LLDPE) unit to 1.6 lakh tonnes per annum and the wire and cables compound unit to 25,000 tonnes per annum from their present installed capacities.

According to sources, even before embarking on the expansion project which is now in the first stage of implementation, IPCL had sorted out the matter of additional feedstock supply with ONGC and it was assured that gas would be made available to it from Uran.

Additional gas supplies from Uran, the Department of Chemicals and Petrochemicals when contacted, explained would not lead to any expansion or additional activity at the terminal. At the most, it would require some debottlenecking and an extra run of the facility for about 50 more days instead of say 300 days at present. This should not be treated as expansion of activity by the Ministry of Environment and Forests.

However, what view clearing Ministry takes on this matter remains to be seen. For, the additional run for 50 days would lead to a certain amount of extra pollution and the extent of damage it would cause to the environment is a matter of calculation.

In case the Ministry refuses to relent, the only other alternative is to import ethylene — as Reliance plans to do for its project — for which a terminal is being constructed at Dahej. The delivery of the gas from the port terminal to the project site will have to be through pipeline. This is in view of the stipulation that the project authorities must explore the possibility of product movement by pipeline and minimise road transport to the fullest extent possible.

The other conditions included in the approval are of a routine

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environmental manager
recycling of all efflue
charge.

Meanwhile, the IPCL
Managing Director, Mr.
along with concerned
MGCC and the Joint S
Department of Chemic
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for talks with the World
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The loan being sought
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CEI ACTION PLAN POLLUTION CONT

The Confederation
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industrial waste exchan
which is a direct servic
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with waste users.

The scheme aims
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The 'green belt' pro
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as Chemplast, to be
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amalgamation though
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of the Act, but MCIC
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ratio was computed by
s of CAS, the MRTPC

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lysilicon and silicon
wafers. There were some in New Delhi who were insisting on import of this critical item, but Metkem proved its mettle.

MCIC manufactures caustic soda, chloromethanes, trichloroethylene, refrigerant gases, hydrochloric acid while Chemplast's activities include manufacture and sale of polyvinyl chloride resins, hydrochloric acid, water treatment chemicals, industrial alcohol and PVC. Besides the Mettur plant, Chemplast has also two industrial alcohol units at Krishnagiri and Panruti.

In fact both MCIC and Chemplast have been working together over the years and have established very close interaction, with a number of inter-se transactions between the two in terms of sale of products, power etc. Indeed, the operations of both the companies are interdependent in terms of supply of critical raw materials, energy etc. The combined cycle power plant set up by Chemplast at a cost of Rs. 12 crores is supplying power to MCIC. The scheme of amalgamation covers the amalgamation with Chemplast of subsidiaries of Chemplast (viz. Vinyl Holdings Limited-VHL Chemplast Investments Ltd.-CIL and Selective Investments Ltd.) holding shares in MCIC.

One of the favourable points for the amalgamation is that after the merger the shareholding pattern will become broad-based in Chemplast. The shareholding of the insurance companies in Chemplast would increase to 24.48 per cent from the present holding of 20.98 per cent.

Besides, the public financial institutions would also hold 5.83 per cent shares in Chemplast. The shareholding of the promoters group would in consequence come down to 53.40 per cent from 67.83 per cent as at present whereas the shareholding of the public would rise from 10.87 per cent to 15.76 per cent.

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Drug manufacturers scope for joint ventures stressed

There was a wide scope for Indian pharmaceutical firms to go in for joint ventures or develop other forms of co-operation with the Soviet firms as shortage of drugs and medicines was a pressing social problem in the USSR. This was stated by Mr. Egor Shwartz, spokesman of the two-week long (December 11 to December 24) exhibition of Soviet machinery and other products in Bombay.

Explaining the dimension of shortages in the field of drugs, he said that Soviet Union could meet only 75 per cent of its needs and only 40 per cent of this total was manufactured in the USSR itself. Specifying few areas of shortages, Mr. Shwartz said that Soviet Union could meet only 30 per cent of cardiovascular preparations, 43 per cent of onchological drugs, 15 per cent of hormones and anti-diabetes drugs.

During the last 12 years, Soviet Union imported 9,600 million roubles worth of pharmaceuticals from other Socialist countries, and Soviet health services would not be able to function without imports, he said. The average yearly increase in pharmaceuticals production had gone down to 4.3 per cent in the current five year period from 5.7 per cent in the previous five years, Mr. Schwartz said.

As health was the State responsibility and the Soviet pharmaceutical industry was not profit-oriented, it caused a heavy burden on the state treasury. The present errors in the Soviet drugs industry, Mr. Schwartz said, were rooted in errors made long ago. The country was faced with the urgent need to rejuvenate the industry as "our newest plants were 10 years old", he said.

The Soviet Union and India, Mr. Shwartz said, could explore the possibilities of manufacturing pharmaceuticals but warned that Soviet authorities were strict in accepting drugs from other countries without proper research and tests. With all our defects, he said, Soviet Union valued its citizens' health very high.

M.P. PHARMACY GRADUATES ASSOCIATION

Election for the year 1989-91 of the M.P. Pharmacy Graduate's Association was held at Indore on 4th Nov. 1989. The office bearers elected are as follows:

President: Pst. Anil Bhatia; Vice President: Pst. Nand Motwani; Hon. Secretary: Pst. Kailash Jindal; Joint Secretary: Pst. Pradeep Johari; Hon. Treasurer: Pst. Umesh Parekh; Executive Members (4): Pst. R.C. Rohira, Pst. Anil Maheshwari, Pst. Sanjay Sethi and Pst. S.B. Gupta.

Two advisors of the association nominated are Pst. Dr. R.S. Gaud & Pst. J.R. Agarwal.

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Despite this good show the sha the company have not really ap ated. In fact the share prices hav to cross the Rs. 100 mark. Its pre top was Rs. 132, reached a few m ago.

One reason for the slow move could be due to the fact that the pany has already issued bonus sha the ratio of 2:5 and also made a debentures issue thereafter. As investors do not expect any signi appreciation in the near future.

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New soap technology to help conserve vegetable oils

Indian scientists have achieved a major breakthrough in soap technology because of which it has now become possible to produce low TFM (total fatty matter) soaps which actually enhance performance. The new technology will directly help conserve vast quantities of vegetable oils, thereby restricting the need for imports — a major policy objective of the government.

This was revealed at Bombay recently by Mr. S.M. Datta, Vice Chairman of Hindustan Lever Limited, who was delivering the key note address at a national conference on Surfactants, Emulsions and Biocolloids. The three-day conference organised jointly by the Indian Institute of Technology (IIT), Bombay and the Indian Society for Surface Science and Technology (ISSST), is being attended by about 200 delegates from Universities, CSIR laboratories, industrial research labs, and the Atomic Energy Department (AED).

Dwelling at length on the technological trend in soaps and detergents, Mr. Datta focussed on several issues of importance in the Indian context. He disclosed that the finding of scientists that only one part of conventional high TFM soaps contributes to the cleaning and lathering function. Half the fatty matter comprised ingredients (palmitate and stearate) which do not contribute to lather and cleaning, but merely help to impart firmness to the soap, structure the mush formed during use, and prevent the soap from getting wasted.

Based on this finding, scientists at the Hindustan Lever Research Centre, Bombay have succeeded in designing a novel structurant technology, which will go a long way towards alleviating the vegetable oil shortage — a major problem facing our country, he said.

This new technology has made it possible to reduce the TFM content of soaps from the current level of 76-80% and, at the same time, enhance the soaps' performance. In the first phase, the dissolution and lathering characteristics of 60 TFM soap is improved by replacing moisture with a non-fatty structurant. The development of tailor-made fat charge of soluble soaps and restructuring the resultant liquid crystalline soap with non-fatty stucturants to obtain the desired product is the second phase of the new technology.

Turning to non-soapy detergents (NSDs), Mr. Datta emphasised the physico-chemical principles responsible for elaboration of NSD products as a composite of several functional ingredients. Among surfactants, linear alkyl benzene (LAB) has been found to be totally acceptable on performance and environmental grounds. Datta revealed that the world demand for LAB is expected to rise to 2.6 million tonnes by 2000 AD from the present 1.8 million tonnes. Demand for LAB in India is likely to go up to 3.7 lakh tonnes by the turn of the century. LAB has been the work-horse of fabric wash products since the mid-sixties and will continue to play a leading role in the foreseeable future, he noted.

According to Mr. Datta, other detergent actives such as alcohol sulphate, alcohol ethoxy sulphate and non-ionics are unlikely to become popular locally because of their high cost. Alpha olefin sulphonate (AOS) suffers from a major negative due to the poor tolerance of its lather to soil in the wash system. Its lime soap dispersing activity is at best a cosmetic advantage because the calcium soap contributes neither to detergency nor foam.

Mr. Datta also stated that, based on cost, performance and safety considerations, sodium tripolyphosphate (STPP) was the near ideal builder in detergents. In India, the phosphate

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GIIC SANCTIONS Rs. 5.93 Cr. FOR DECEMBER

Gujarat Industrial Investment Corporation Ltd. (GIIC) has sanctioned assistance worth Rs. 5.93 crores to 10 units for the month of December 1989. Of these 10 units, eight are new ones, while two existing units have been granted assistance for expansion. The amount sanctioned in a meeting held on Dec. 8 will generate investments worth Rs. 14.33 crores in the State, besides creating employment opportunities for a number of people.

The projects granted assistance include textile industries for texturising, twisting and processing of yarn, pharmaceuticals for the production of bulk drugs and formulation of engineering units for high tensile pre-stressed wires and refrigeration systems and food flavours and colours manufacturing units.

CIFTI FOR BANNING UNSAFE COLOURS

The Confederation of Indian Food Trade and Industry (CIFTI) convened a special meeting recently to consider the use of colours in processed food items. The meeting was organised at New Delhi against the backdrop of the Government proposals to ban use of colours in certain food items and the complete prohibition of these colours in confectionary items, a CIFTI release said recently. The President of CIFTI, Mr. S.P. Virmani, said that unsafe colours should be prohibited and agreed to the Governments proposal for delisting fast red-E and green-S from the list of permitted colours.

CIFTI has, however, criticised the ban on certain colouring agents like amaranth and allura Red-C. They said the ban was not based on scientific facts

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Mr. Dinesh L. Thakkar

Call to form Indo-EEC business council

The Associated Chambers of Commerce and Industry (ASSOCHAM) has suggested the formation of a joint Indo-European Economic Community (EEC) business council by way of an apex marketing intelligence-cum-promoting organisation to enhance India's exports and industrial collaboration at the enterprises level with the 12-nation EEC.

An ASSOCHAM theme paper on India and the EEC 1992, has called for substantial changes in the country's production and export pattern in the light of re-alignment in global markets emanating from the formation of five trading blocs, viz., North and South America and Canada, the EEC, Japan, the USSR, socialist countries and China, Africa and the Middle East.

It said a unified European market in 1992 would offer excellent potential for the export of items from India like textiles and garments, leather and leather products, diamonds and jewellery, bulk drugs, marine products, tea, coffee, jute, chemicals, engineering goods and electronics.

The chamber paper said the emergence of a single Europen market might end the multi-fibre agreement (MFA), an obnoxious trade pack stipulating discriminatory quota entitlements by countries of the EEC and the U.S on the import of textiles into their countries from the third world.

As this is likely to subject Indian Garments to stiff competition from more efficient textile producers such as South Korea and Hong Kong, the chamber said the Indian textile industry should built a high fashion profile in the EEC market for which the government should provide the requisite encouragement.

In this regard, the chamber pleaded for the import of textile machinery free of duty but linked to an export obligation to avoid abuse. Facilitating for training in specialised items must be created to ensure that Indian garment exports are diversified.

The Apparel Export Promotion Council, together with the National Insitute of Fashion Technology and the Industry must set up a centre on a cost sharing basis to train workers for the garment industry.

As the garment industry obtains export orders for high priced sophisticated garments with often short delivery schedules ASSOCHAM called for the setting up of bonded warehouses where foreign suppliers c
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The chamber catalogued
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PERSONALITIES

Mr. P.V. Karandika
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Mr. S.P. Gupta has jo
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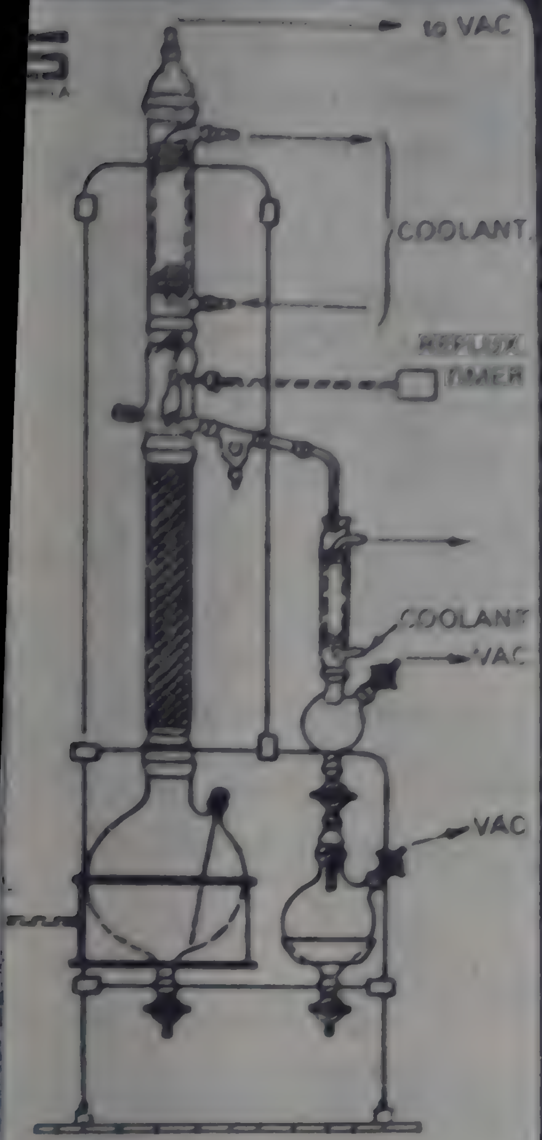

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national congress of essen-
grances and flavours, orga-
he Perfumes and Flavours
of India (PAFAI), the
Oil Association of India
other concerned bodies in
has served to highlight the
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nd allied products.

been acknowledged as the
rgest source yet remaining
. Ironically, this has not
the industry to plan export
in a big way. It is true that
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ever, the industry is keen to
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crores by 1992, the attain-
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share of exports in the
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The industry obviously feels
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is that the industry will have
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growing trees yielding raw
for essential oils is shrinking.
try has urged the Government
the situation by treating nat-
ural oils as plantation products
ing exemption to them from
ceiling legislation.

overnment would have perhaps
d this demand had the indus-
the initiative in the past in
encouraging villagers to augment supply of essential oils by growing the requisite types of trees.

Unfortunately, the industry has little to show by way of planned tree development. Moreover, the Government treats the industry's products as luxuries. A study team sponsored by the Economic and Social Commission for Asia and the Pacific had surveyed the industry in India and some other countries and suggested measures for boosting exports from India.

The Government, however, more or less ignored the study team's recommendations. As overseas competitors have turned their attention to synthetic materials, they have naturally focussed on research and development.

By contrast, the industry in this country had neglected this area until recently. The very fact that the industry claims that "it is for the first time that the PAFAI and the EOAI jointed hands with Government laboratories and the Export Promotion Council suggests that hitherto there was no co-ordination among these bodies. It is to be hoped that the common platform provided by the international congress to these bodies will act as a springboard for the growth of the industry.

ENVIRONMENTAL MEET

The sixth annual conference of the National Environmental Science Academy (NESA) and a symposium on 'Environment and its Conservation' will be held at the C. Abdul Hakeem College, Melvisharam, near Vellore, from December 29-31. Dr. L. Ayub Khan, Head, Department of Zoology, of the College, who is also the director of the symposium, said the purpose of the symposium, was to review the laws governing environment protection.

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WORKS

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HFC resumes handling fertilisers

Hindustan Fertiliser Corporation (HFC) has resumed high-sea operation, i.e. handling of imported fertilisers, after a gap of three years. The Union government has allocated three ships carrying about 20,000 tonnes of DAP (Di-ammonium phosphate) and 30,000 tonnes of complex fertilisers (15:15:15). Over 38,000 tonnes have already arrived at Saugor anchorage.

HFC, according to informed sources, is likely to get a further allocation of not less than 50,000 tonnes during the remainder of the current financial year. However, the import is expected to benefit only West Bengal farmers, as the entire consignment unloaded at Saugor is being pushed into the West Bengal market.

Part of the import has already gone to meet the demand of the rabi crops like potato and wheat and the balance is to be made available for the boro crop. At the last allocation meeting for the rabi season of 1989-90, West Bengal was allocated about 3.5 lakh tonnes of DAP, including 1.7 lakh tonnes of imports. The shortfall in import, if any, will be only marginal, it is felt.

However, the situation in Bihar is not as comfortable. About 1.4 lakh tonnes of imported complex material (DAP) are to be supplied to that state to meet the demand in the current rabi season, but no indication is available as yet where the import is going to come from. None of the ships allocated so far in different eastern ports have been designated for the Bihar market. This is important because the demand for complex fertilisers in Bihar will be over by December 15. Unlike in West Bengal, there is no boro cultivation in Bihar.

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If indigenous naphtha is not available in sufficient quantities it should be imported to reap the benefit of value addition from naphtha to polymers which is six to ten times, the federation said.

Areas of futuristic application of petrochemicals in the field of space, marine and sub marine, defence, biomedical, agriculture, building and construction, teletonics need to be identified and specialised centres need to be set up to cover certain critical application areas requiring systematic project development and standardisation.

To bring down the capital cost of Indian plants to international levels, custom duties on capital goods and technology imported for the petrochemicals sector should be abolished. Duty structure on indigenous capital goods used in the petrochemicals industry should be reviewed and simplified leading to a lower incidence of duties and taxes.

CHANDRAN ELECTED FAI CHAIRMAN

Mr. N.B. Chandran, chairman and managing director of two major public sector fertiliser firms, namely, the Fertilisers and Chemicals Travancore Ltd. (FACT) and Hindustan Fertiliser Corporation (HFC), has been elected chairman of the Fertiliser Association of India (FAI), the apex body of fertiliser manufacturers in the country. His term is of two years.

An official release by FACT said that with over three decades of experience in chemical industry, Mr. Chandran has distinguished himself as a leader in the fertiliser industry.

During Mr. Chandran's [illegible] [illegible] [illegible]

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OIL, GAS EXPLORATION

Indigenisation to be slow

There are indications that the process of indigenisation of exploration and development of oil and natural gas will remain slow in the Eighth Plan.

A sub-group on exploration and development has fixed a target of 65 per cent indigenisation by the end of 1994-95. As far back as 1987-88, the level of indigenisation was 53.03 per cent.

The sub-group has recommended that the policy of price preference for indigenised equipment should be for a limited period of five years. This will enable the domestic producers to establish themselves independently.

At present the support price given for indigenisation is passed on to the Oil and Natural Gas Commission and Oil India Ltd. It is suggested that if the prices of indigenised items remain higher than the cost of imported item even after five years, the extra burden on ONGC and OIL will be gradually removed.

At present, different types of domestic equipment for exploration cost two to 53 per cent more than the lowest technically acceptable foreign offer. This comparison is made when the foreign offers are not loaded with customs duties, port handling and inland transportation charges.

One of the main factors for this high cost is that the principal raw materials — steel and fuel are very expensive in India. The infrastructural facilities for the manufacture of these equipment are also quite poor.

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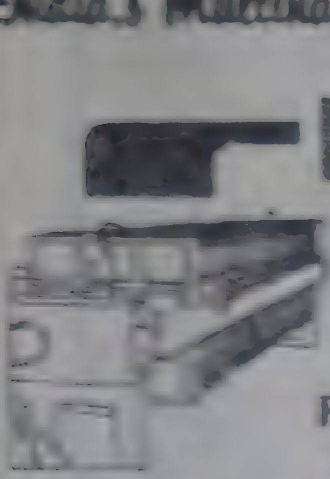

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ONGC strategy to speed output

A concept on zero delay in the start of production from the date of discovery of oils is being adopted for the first time by the Oil and Natural Gas Commission (ONGC) at Lingala structure in Krishna-Godavari basin. The new concept would help in immediately starting production without waiting for the full development of the field or even the commissioning of the early production system (EPS).

Oil was struck at Lingala in the West Godavari district in Andhra Pradesh on November 19 this year. The oil flowed at the rate of 559 barrels per day and 22,7[illegible] cubic metres of gas per day. The production rate of oil and gas is considered to be quite prolific. The oil being produced is light which is rated as good. The discovery is expected to add about two million tonnes to the already established 24.59 million tonnes of geological reserves.

The production at Lingala is continuing through a temporary tankage arrangement for onward transportation of oil to Vizag refinery. The production through temporary tankage is likely to continue for the next two weeks when the early production system (EPS) is expected to be installed. The estimated production of oil from the structure would be about 350-400 barrles per day.

The discovery at Lingala is the third oil strike by ONGC in the Krishna-Godavari onland. There have been two other discoveries of oil in the Krishna district Kaikalur and Bantumilli. Oil was struck at Kaikalur in July 1986 and at Bantumili in January 1989.

The two structures have been producing through early production systems. Bantumili is located in the same sub-basin and further exploratory efforts in this region are expected to be very rewarding.

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e has been given with s and restrictions. The en directed not to use ran terminal "since the Gas Commission has ing for not expanding any activities at Uran. Some of the important conditions stipulated are:

— a revised environmental impact assessment report and environmental management plan to be submitted for review to the Ministry within six months.

— exploration of the possibility of product movement by pipeline and minimising road transport.

S & T FAIR NEXT MONTH IN COCHIN

A science and technology exhibition highlighting the vast progress made in the fields of science and technology in the country would be organised at Cochin from January 26 to February 15 in connection with the 77th session of the Indian Science Congress to be held at the Cochin University of Science and Technology campus. Dr. N.R. Menon, vice-chairman of the Indian Science Congress Exhibition committee, told newsmen that 100 stalls and pavilions would be put up at the exhibition.

OIL EXPLORATION BY PRIVATE FIRM

With the Government of India having decided to encourage the private sector in oil exploration, the Bombay-based Hindustan Oil Exploration Company Limited has taken the lead in prospecting for hydrocarbons in the country, according to its Managing Director, Mr. Ajit C. Kapadia.

The firm has currently three projects on hand. According to Mr. Kapadia, the HOEC has reached an understanding with Oil India Limited for a joint exploration project in any of the new areas for which OIL receives exploration licence. The HOEC has signed a letter of intent with the International Petroleum Limited for exploration in the Krishna-Godavari offshore basin with a share in benefits should the efforts result in the discovery of hydrocarbons.

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Petrochem reverted to Petroleum Ministry

The Department of Chemicals and Petrochemicals, which hitherto had been under the Industry Ministry, has been reverted back to its parent Ministry of Petroleum.

With the Rajya Sabha member of the Janata Dal from Karnataka, Mr M.S. Gurupadaswamy as the Cabinet Minister, the Ministry of Petroleum and Natural Gas — as it was under the Rajiv regime has been renamed the Ministry of Petroleum and Chemicals.

According to official sources, the National Front (NF) Government effected what the Congress-I Government under Mr. Rajiv Gandhi had been toying with for some time. Although the delinking of the chemicals and petrochemicals wing from the Petrochemicals wing from the Petroleum Ministry was done when Mr J. Vengala Rao took over as the Industry Minister, it was soon found that the change created more problems than it was envisaged to resolve.

For one, it meant co-ordination and discussions between two entirely separate ministries while deciding on the petrochemical complexes during the Eighth Plan. While the supply of natural gas, the basic raw material for gas crackers for the production of ethylene, was under the administrative control of the Ministry of Petroleum and Natural Gas, the petrochemical complexes as such were under the control of the Department of Industry Ministry. This led to additional paper work and inordinate delay in the sanctioning of projects.

The move for an end of the experiment and reversal to the original position gained ground after the unseemly controversy between the ministry and the department over the selection of the implementor for the Auraiya petro-

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account, it may be possible to have sufficient crude for six million tonne refinery. This is particularly so in view of the exploration efforts now on in the region. If the government ultimately decides to have only 16 million tonne refinery in the eastern region, the Daitari refinery proposed by IOC will also have to be dropped.

The fate of the three million tonnes Mangalore Refinery and petrochemical project also hangs in balance. The price has not been found to be sound on economic considerations.

The government has, however, been dragging its feet in the matter as the Hindustan Petroleum Corporation Limited (HPCL) has signed a memorandum of understanding with Indian Rayon for the project. One view in the government, therefore, is that it should not back out of its commitment.

However, there are others who point out that the MoU does not bind the government to the project since it provides that in case the govt. does not proceed with the project, costs will be shared between the HPCL and Indian Rayon.

No investment decision on the project has been taken by the government so far. Much will, however, depend on what political stand the new government takes.

The progress of the six million tonnes Karnal Refinery project has been extremely tardy due to the attitude of the Tatas and the Soviets. The Soviets have offered to execute the project on a turnkey basis as well as on a technical co-operation basis. The Soviet turnkey offer has been found to be very expensive. But, Tatas have been unwilling to execute the project on a non-turnkey basis.

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foam the polyurethane resin. The methods reportedly include some way of whipping the chemicals into a froth before they polymerize. Last year, Union Carbide, Mobay Corp and ICI Polyurethanes have also reported water-blown techniques for polyurethane foams.

Polyurethanes foam from reaction of an isocyanate-toluene diisocyanate (TDI), for instance -- with a polyol, which is typically a polypropylene glycol of molecular weight 3000. Water added to the polyol component reacts with some TDI to form CO_2 and toluene diamine to a CO_2 fluffs the resin into a foam, expanding it into a large bun in the mold. TDI left over from the reaction with water forms urethane (carbamate) linkages with hydroxy groups of the polyol and urea linkages with amino groups of toluenediamine and, in BASF technology, melamine also.

The low free-energy content of the melamine triazine ring makes the resin less flammable. Therefore Rest Easy makers, furniture manufacturers and retailers hang tags that identify them as environmentally acceptable.

One limitation of any water blown technology is inability to reach densities lower than about 1.4 lb per cu.ft. This is because the evaporation of CFCs not only moderates the heat of polymerization within buns but also forms the resins.

Thus for the moment, water blown foams cannot capture the market for 0.9 lb per cu. ft foams now use in backs and arm rests and in cushions of low cost furnitures. But BASF points out, densities of foams in thus less critical furniture applications may have to use in the future because of the phaseout of CFCs as countries around the world move to protect the Earth's ozone layer.

With the new foam process BASF looks at the prospect for as much as 70% of the more than 1 billion lb-per-year US market for furniture seatings and mattress foams. (*C & EN.*, *6/5/89*, *p. 5*)

A SUPERIOR NITROGEN MEMBRANE DEVELOPED TO GENERATE PURE NITROGEN FROM COMPRESSED AIR

Generation of 99.9% nitrogen from compressed air with a recovery efficiency of 22% is being claimed for new hollow fibre membrane separation modules introduced last June by Generon Systems, a joint venture established last February by Dow Chemical & BOC Group, a UK industrial gas company.

Dow introduced its first membrane air separation modules in the early 1980s for applications requiring 95-97% inert gas. Dow notes that some membranes have very high separation efficiency but work slowly, whereas others work quickly but have low efficiency.

The new Generon HP module, which Generon says will have serve the bulk of gaseous nitrogen applications (98 to 99% purity) is the result of a search for a polymer that would have high separation efficiency but still be fast enough to be useful in the field. The module is reported to have the best purity/efficiency performance yet achieved for hollow fibre membranes. (C & EN., 6/5/89, p. 15)

WORLD CONFERENCE ON BIOGAS TECHNOLOGY IN EARLY 1990 IN PUNE

Biogas is progressively becoming an alternative non-conventional energy particularly in Third World countries. It is a measure for our growing environmental awareness and the economic value of biogas that as many as [illegible], multilateral agencies and non governmental organisations will be taking part in the global conference in Pune early next year to discuss biogas technologies and strategies for implementation.

China with its 3 million biogas units and India, which now has nearly 1 million 'gobar gas' facilities are considered expert in the field. The West German ministry for economic cooperation and India's department for non conventional energy sources are primarily sponsoring the Pune Conference on Biogas in 1990.

The Conference is expected to place emphasis on high technology biogas plants and their application to farms and poultry centres.

The West German Breman-based Overseas Research Development Association has been particularly active in the field. India produces 90 million tonnes of cattle manure annually, along with 40 million tonnes of farm wastes representing a vast potential for non-conventional energy.

The rise in the developed countries of the West of the 'green economy' concept will also help Third World countries to examine the socio-economic and financial aspects of biogas and its weightage in the conventional assessment of a nation's energy resources.

The Pune Conference will highlight recent advances in biogas technology such as intensified process of the methane production, sewage treatment by anaerobic digestion, low temperature biogas production and treatment of industrial waste.

In recent years there has been an active interest in biogas technology in Third World countries due to economic and ecological reasons.

[illegible] Lankas have recently installed pilot plants on the Chinese or Indian models.

A COMMON PRACTICAL BASIS FOR MEASURING VOLTAGE & RESISTANCE TO BEGIN ON JAN 1, 1990.

On Jan 1, 1990, all industrial nations for the first time will share a common practical basis for measuring voltage and resistance. At a recent meeting in Sevres, France, national representatives of the world's weights and measures community met and adopted new standards that will require that US voltage and resistance standards be adjusted by 9.3 and 1.7 ppm respectively.

The National Institute of Standards & Technology (nee NBS) of USA will be responsible for the change. For further information contact Michael Baush of NIST. (*Chemtech*, 4/1989., p. 1, Bc)

MICROWAVES HARNESSED FOR PREPARATION OF HIGH TEMPERATURE SUPERCONDUCTORS

Microwaves can do a good on inorganics, as in the preparation of high temperature superconductors. It turns out that CuO is especially efficient at absorbing microwave energy and can go from room temperature to 550°C in a minute at 500 W.

If CuO is mixed with La_2O_3 on a brick in the oven and turn the oven on, the mixture glows orange in 1 min and is liquefied in 9 mins. Cooling produces La_2CuO_4 and further heating at medium power for 30 mins. leads to the product normally accessible after 12-24 hours of conventional processing.

A series of materials are accessible this way and the properties of the products are being evaluated for any differences from conventional products. [illegible]

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The heart of the process is an electrochemical cell with a proprietary membrane and an $AgNO_3$ HNO_3 electrolyte. Organic wastes are converted in the anolyte to CO_2, CO and H_2O. Any nitrous acid formed in the catholyte, is recovered and converted to nitric acid.

Destruction efficiency has not been measured against US standards, but developers believe the unit would comply with the 99.9999% required for most toxic materials. Operating costs, however, are 2 to 3 times those of thermal processes. (*Chem Eng.*, 9/89 p. 17).

AN ARTIFICIAL IVORY BASED ON CERAMICS ON THE HORIZON TO SAVE ELEPHANTS FROM EXTINCTION.

An artificial ivory made from ceramics could help to save the African elephants. Unlike the material's earlier plastic alternatives, the new ivory substitute is porous, so it feels much more like real ivory than any other.

Natural ivory is very similar to dentine, the material which makes up human teeth. People prize ivory because it is cool to the touch. It is soft, so it can be carved and polished to leave a smooth surface. Concert pianists like it because its porous structure absorbs sweat.

At present, artificial ivories are based on plastics. But their poor conductivity and inability to absorb sweat make them feel warm and uncomfortable to the touch.

Recently, John Binner at the University of Nottingham is developing a range of advanced ceramics which conduct heat well and are porous. It is reported that their structure is far more similar to ivory than that of plastics.

Binner has prepared a number of [illegible]

the conductivity, weight and porosity of the material, so that it is as close to real ivory as possible.

The World Wild Life Fund for Nature estimates that there are only 700,000 African elephants left – less than half as many as a decade ago. Their numbers are declining by as much as 10% a year. In some countries such as Kenya and Uganda, the decline is more alarming with reduction of 85% since 1987. Poachers in these areas can earn as much as a year's wage by killing one animal and hacking off its tusks. (*New Sc.*, 8/26/89, p. 35)

SHEFFIELD CITY (UK) SHOWS THE WAY FOR RECYCLING METAL, PAPER, GLASS, PLASTIC BOTTLES AND WASTE OIL

Sheffield is the first city in Britain and perhaps in the world to develop a practical recycling system for recycling urban waste from homes. As a result the city is planning the country's first door-to-door programme for collecting domestic materials that are recyclable.

Very soon up to 10,000 households will have special containers for storing paper, glass, metal and plastics. A fleet of vehicles will gather and sort the material. Similar projects are also under way in USA, W.Germany and the Netherlands.

The organizers also plan a scheme to recycle aluminium. It involves [illegible] and other that will collect the material with bags and magnets. Metal recovered in this way will be sold back to the aluminium industry, at commercial rates, thus providing extra funds for those organizations taking part. The Sheffield initiatives are intended to be a model for similar projects in other parts of Britain.

The Scheme in Sheffield results from co-operation between [illegible] and voluntary groups, the local [illegible] [illegible]

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of the scheme.

Steve Jenkinson, the Asst. Director of Waste Disposal at Sheffield City Council reports that there had been an enthusiastic response to the initiative with 40% of the public being involved. The council is keen to increase the number of participants.

If the scheme collects 50 kg. of paper from each household in Sheffield, then it would be saving 250,000 trees each year. The existing recycling schemes are recovering up to four fifths of the cans discarded in the city every year; around 70 million cans are being recycled. It is expected the Sheffield Scheme will retrieve around 9.5 million glass bottles each year and more than 20,000 gallons of lubricating oil.

Sheffield together with neighbouring councils in South Yorkshire is currently investigating the country's first scheme by local authorities for collecting discarded refrigerators in a bid to make sure they are not broken up carelessly, releasing chlorofluorocarbons, which break down ozone in the stratosphere, leading to the creation of the ozone hole. (*New Sc.*, 9/16/89, p. 29).

A POLYMER SINTER (POROSOFT) WITH UNIQUE ABSORPTION PROPERTIES

A high-molecular weight co-polymer of acrylonitrile (AN) and vinylacetate (VA) called 'Porosoft', has been recently developed by Spacy Chemical Co. (Hachioji, Japan) for filtration and air-diffusion applications. Its main characteristics reported, are high gas permeability, high affinity for water, and virtually instantaneous absorption of aqueous solutions and organic solvents.

The material is made by first heating and press forming an AN-VA powder. The resulting sinter - (so-called because of the way in which it is made) has pores of 30-50 micrometers diameter. In addition, when placed in hot water (70-80°C) it can be
even by hand.

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Eng., 10/1989, p. 2

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lvantage in the usage of hydrochloric acid
phosphate is that the acid is highly corro-
dvantage is the resultant reaction products,
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he separation is not as easy as in sulphuric

separate calcium chloride and phosphoric
y in Israel by Abraham Baniel, Ruth Blum-
ssentially the process involves digestion
with hydrochloric acid; and subsequent sol-
th a C_4 or C_5 alcohol, a ketone, or an
e solvent is recovered by evaporation and

manufacture orthophosphoric acid consists in reacting rock phosphate with hydrochloric acid to obtain an aqueous reaction mixture which is then contacted with an organic solvent when phosphoric acid passes into the organic phase. The solvent phase is then separated from the aqueous phase and the resulting solvent extract is washed with water to separate the acids from the solvent. The acids are then separated and phosphoric acid is recovered. The flow diagram of the process is shown. The manufacturing process is detailed below:

Digestion

Aqueous hydrochloric acid is added to rock phosphate powder in a digestor. Mechanical foam breakers are used to control the foaming. The gases evolved during the reaction consist of carbon dioxide, silicon tetrafluoride and hydrofluoric acid, moisture and entrained hydrochloric acid. The reaction is completed in about an hour.

Hydrochloric acid about 22% strength used is about 2 tons on hundred per cent basis for every ton of P_2O_5 for a rock phosphate containing about 32% P_2O_5. Slightly excess acid is used to avoid the formation of monocalcium phosphate. The resultant reaction products are calcium chloride, phosphoric acid and materials insoluble in acid. The insolubles constitute about 10% by wt. of the rock phosphate used and contain silica, fluoride, clays and organic matter.

The insolubles are separated by sedimentation and the solids containing the underflow are washed in a countercurrent decantation system and the overflow liquid is recirculated to the digestor. The overflow liquid from the thickener constitutes the aqueous reaction mixture which is pumped to solvent extraction tank. The thickener area required is one square metre per every ton of P_2O_5 approximately.

The main ionic constituents of the aqueous reaction mixture are calcium, hydrogen, phosphorous, chloride, fluoride or silicofluoride, iron and any other soluble minor elements. The typical liquor composition when Moroccan rock phosphate used is as follows:

Moroccan rock phosphate composition in %	
P_2O_5	31.5
CaO	50.2
F	4.0
Fe_2O_3	1.1
SiO_2	2.7
CO_2	5.4
LOI	[illegible]

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* Sharma Consultancy Services (Madras) Pvt. Ltd., 11,
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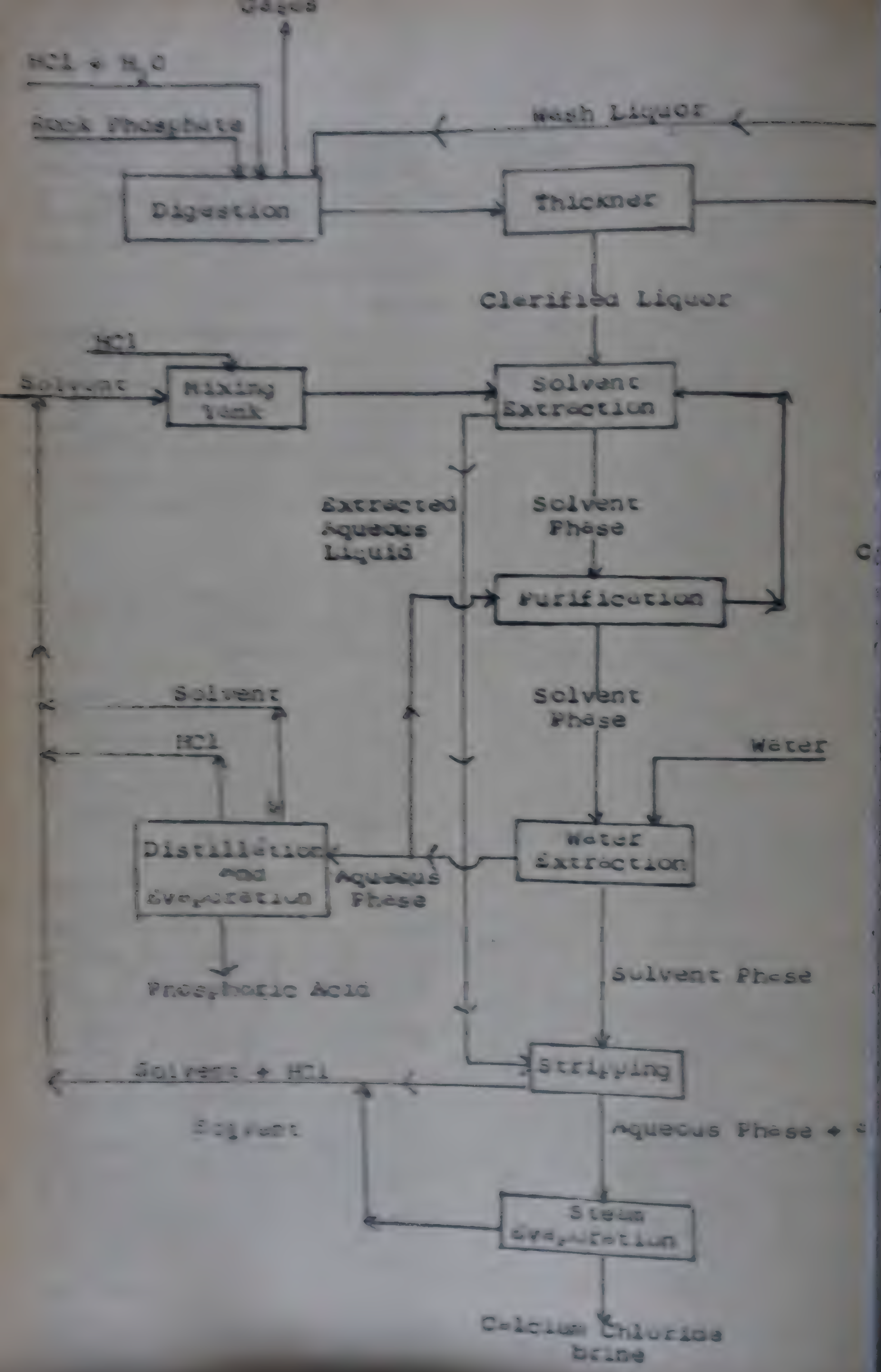
Gases
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Rock Phosphate
Wash Liquor
Digestion
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Purification
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Solvent Phase
Water
Distillation and Evaporation
Aqueous Phase
Water Extraction
Phosphoric Acid
Solvent Phase
Solvent + HCl
Stripping
Solvent
Aqueous Phase +
Steam Evaporation
Calcium Chloride brine

[illegible]

composition in G/Litre

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Sp. gr. 1.33

ca & fluorine existing in the liquor can ating & filtering the precipitate formed suitable sodium salt in amounts equal amount of silica & fluorine present in

are mainly containing calcium chloride is pumped to solvent extractor which of mixer-settlers wherein it is contacted h an organic solvent which is a solvent the presence of free hydrochloric acid. d is added to the organic solvent before ir reaction mixture. Here the phosphoric part of hydrochloric acid and a minor hloride passes from the aqueous phase while the bulk of calcium chloride and drochloric acid remain in the aqueous lvent used for extraction is capable of ted phosphoric acid in the presence of eferably in excess over the equivalent present but has limited miscibility with in the absence of phosphoric acid, and oth phosphoric acid and calcium chlo- lvents customarily used for this opera- or phosphoric acid but are very selective ing calcium ions.

calcium chloride content brings about ter content in the solvent phase and of n the aqueous phase. Hydrochloric acid of the organic solvent phase. The dis- l in the present case) between solvent ncreases with the increase in the cal- ration level. This is the basic effect that on of phosphoric acid; the high level the extraction step promotes the trans- accompanied by both anions present. he presence of free hydrochloric acid full extraction of the phosphoric acid. containing H_3PO_4, HCl and a minor s into the purification battery and the quid into evaporator.

[illegible]

amount of Ca^{2+} contacts the aqueous H_3PO_4/HCl mixture of the correct concentration from water extraction battery which washes back this Ca^{2+}, producing a solvent extract of high purity containing a mixture of H_3PO_4 and HCl. This reflux is made possible by the fact that the solvent extract is unsat urated with respect to water.

Water extraction

The solvent phase containing phosphoric acid and hydroch loric acid after getting rid of calcium chloride is taken to water extraction consisting of a battery of mixer-settlers. Water is used countercurrently to separate phosphoric acid and hydrochloric acid from the solvent phase releasing the sol vent. The solvent thus released which is saturated with water is pumped to the next battery. The mixture of phosphoric acid & hydrochloric acid obtained as an aqueous solution is pumped to evaporator.

Evaporation and distillation

The aqueous phase containing phosphoric acid and hydrochloric acid and also minor quantities of solvent is subjected to multiple effect evaporation. The solvent is eliminated at the point of lowest temperature & recovered. The aqueous acid feed boils at 104°C at atmospheric pressure and a 95% phosphoric acid boils at 200°C and at this temperature hydrochloric acid is completely eliminated from the product acid up to a concentration of 20% and can be used in the process as such. The requirement of steam for evaporation is around 0.45-0.50 tons per ton of distillate.

Stripping

The purified solvent which is saturated with water is pumped from water extraction battery and is contacted with the aqueous liquid containing calcium chloride & hydrochloric acid pumped from the solvent extraction battery. The solvent strips hydrochloric acid from the calcium chloride brine and is ready for use again in the solvent extraction. The calcium chloride brine contains some dissolved solvent. The azeotrope of solvent with water is obtained by steam stripping the brine. The recovered solvent is reused in the process and calcium chloride liquor is disposed as waste.

Mass transfer is rapid & phase separation good in all batteries. Volumes in the various batteries are a function of composition, concentration, and the solvent chosen. Generally the volume throughput lies between 20 and 30 m³ per ton of P_2O_5 processed. The phosphoric acid obtained is in a state of much greater purity than it is by conventional processes. It is free from calcium & other cations but traces of a few heavy metals such as iron, chromium & uranium that is present in the rock phosphate is coextracted with the phosphoric acid. The extraction of P_2O_5 from tricalcium phosphate by the process is very efficient & recovery of [illegible] of the total P_2O_5 [illegible] cient & recoveries of 96-98% of the total P_2O_5 originally present may be achieved.

The above process involves the usage of alcohols like normal butyl alcohol & isoamyl alcohol and also ketones. If an organic amide is used as a solvent for extraction for example N,N-di-n-butyl acetamide the extraction of phosphoric acid from a given composition liquor is 175 parts compared to 100 parts if normal butyl alcohol is employed.

One of the advantages in using the amide solvent alone or in combination with alcohols like isoamyl alcohol is that the decomposition liquor can be discarded after the extraction without having to undergo a treatment for the recovery of solvent since the amide is negligibly soluble in water. The quantity of amide solvent required for extraction is relatively smaller in quantities compared to alcohols or ketones. It is also known that at higher temperatures the solubility of phosphoric acid in the amide solvent is increased & this property is made use of to recover the phosphoric acid by varying the temperature of the extract.

Dow Chemicals have developed a process somewhat similar to IMI process using trialkyl phosphate as the solvent. The process is to acidulate rock phosphate or any other phosphate containing ore with aqueous hydrochloric acid, the resulting orthophosphoric acid is extracted from the reaction solution by contacting the solution with a substan immiscible trialkyl phosphate, and the extracted acid is stripped from the acid-laden organic extrac liquid extraction with water. The solvent employ erably tributyl phosphate though other trialkyl pho trioctyl phosphate, trihexyl phosphate, ethyl diocty can be used. This process is useful in preparing phosphoric acid by washing the solvent extract 30% pure phosphoric acid to remove calcium c extracted prior to washing with demineralised

The capacity of the plant adopting this method a high quality of phosphoric acid is about 100 T hydrochloric acid is required as a raw material in l tities a captive chlor-alkali industry is necessary hydrochloric acid. Caustic soda produced can be manufacture of various sodium phosphates like phosphate, sodium hexametaphosphate, sodium t phate and tetra sodium pyrophosphate. The proce as long as the cost of hydrochloric acid is cheap phuric acid.

The by-product calcium chloride is disposed sea assuming the industry is coastal based. The lutants like fluorine and hydrogen chloride vapo controlled easily.

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Science Briefs

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mune system for a year
or so until the microfilariae appear in the blood or the clinical symptoms begin to show. The host-parasite relationship is further complicated by the fact that chronic filarial patients with clinical symptoms do not show microfilariae in the blood.

For detection of active filaria infection, or in assessment of the effectiveness of chemotherapy, the level of circulating antigens in the serum is more informative than antibodies. A major source of antigens is a microfilariae culture fluid containing excretory-secretory (ES) antigens. As little as 0.35 nanograms of ES antigen protein per well of the petro plate was found to be sufficient to detect the filarial antibodies by ELISA.

One ml. culture was sufficient for 400,000 tests — a boon in the light of the very low availability of antigen. The test kit developed at MGIMS is probably the first in the world to use ES antigens and penicillinase enzyme.
– P.T.I. Science Service, Dec. 1-15, '89

SORGHUM REGENERATION THROUGH INFLORESCENCE CULTURE

Scientists in Bombay have reported successful regeneration of sorghum through culture of immature inflorescence segments, which may help in mass-scale propagation of the cereal plant. Sorghum bicolor is a major cereal crop of Asia and Africa, grown both for food and animal feed. In India, it is cultivated mainly in the arid and semi-arid zones where rainfall is low and unreliable.

Scientists at the plant biotechnology section of the Bhabha Atomic Research Centre (BARC), Bombay, initiated tissue culture studies in sorghum, in a bid to standardise techniques for large scale in-vitro propagation of the plant. A team headed by Dr. P.S. Rao grew segments of young inflorescences co lected from two field-grown hig yielding cultivars, using Murashige an Skoog's culture medium supplemente with growth hormones. Calli appeare within 10-12 days of culture, researchers Leela George, Susa Eapen and P.S Rao said reporting their findings in the journal Plant Sciences.

Numerous white somatic embryos developed on the surface of the callus. The embryos later differentiated into shoots and roots to form plantlets tha looked normal, like any ordinary seed-raised plantlet. Both somatic embryogenesis and plant regeneration were recorded with high frequency, the report said.

The age of the inflorescence was the most critical factor in determining the frequency of somatic embryogenesis, with younger inflorescences showing a better response than older ones. Als cytokinins such as kinetin or zeatin in combination with triiodobenzoic acid (TIBA) enhanced the frequency of somatic embryogenesis.

The rooted plants grew satisfactorily in soil in paper cups and also in the field, and more than half of the transplanted plants survived to the seed-setting stage. The second-generation plants are now being grown in the field and are being tested for somaclonal variation, the report in Plant Sciences said.
– P.T.I. Science Service, Dec. 1-15, '89

VITRINITE REFLECTANCE — NEW METHOD FOR GEOLOGICAL TIME STUDY

A new method for geological time study is in the offing, with researchers claiming that reflectance by vitrinite, an organic compound present in coal layers, is a good indicator of the age of deposits. Knowledge of the age and composition of different sedimentary formations is necessary for exploration of fossil fuel deposits like petroleum and coal. Generally, the age of the sedimentary rocks is determined by establishing the age of the numerous micro and macro fossils present in their layers.

But sometimes, there may not be enough fossil formations in the sedimentary layers, or their identification may be difficult. A research paper presented by Dr. Swapan Bhattacharya, a scientist from the Oil and Natural Gas Commission, at the 14th International Organic Geochemistry Meeting in Paris earlier this year offers a solution to some of these vexing problems.

Dr. Bhattacharya says measurement of reflectance by vitrinite helps researchers to establish the maturity of organic sediments. Vitrinite is an organic compound that is invariably present in coal deposits which are abundant in all sedimentary deposits in one form or the other, be it peat, lignite, bituminous, anthracite or graphite.

Vitrinite reflectance generally increases steadily with depth, says Dr. Bhattacharya, who has also attempted to deduce the individual effects of time and temperature on vitrinite reflectance. According to him, the time plane can be constructed through two or more drilled wells.

Plotting the values of vitrinite reflectance against the depth gives a maturity profile of the sedimentary formation. The point of intersection of two maturity profiles is used as a reference point to interpolate other reflectance points by rotation and the corresponding time equivalent values. The method helps to construct different time planes for different litho units.

The time plane constructed by vitrinite reflectance matches well with the paleontological time plane, and the method may prove to be an additional tool for constructing the time plane. Dr. Bhattacharya hopes to standardise the method further for geological time study.

– P.T.I. Science Service, Dec. 1-15, '89

TUFTAN — FOR IMPROVED LEATHER TANNING

An award-winning invention, Tuftan, may help in better uptake of dye during tanning of leather and impart more strength to the finished product. Tuftan is a dispersion of a polyamide and consists of amino and carbonyl reactive groups which are capable of interacting with tanning materials. The carboxyl groups help to fix chrome better on the leather, while the amino groups help in improved dye uptake, resulting in intense dyeing and less wastage. Conventional tanning and retanning materials are based on phenolic, carbonylic, acrylic and resin compounds.

Tuftan was jointly developed by scientists at the Central Leather Research Institute, Madras, and the Shri Ram Fibres Ltd., Madras who were jointly awarded Rs. 20,000 by the National Research Development Corporation for the invention this year. The use of Tuftan offers considerable benefits: better chrome fixation, (upto 95 per cent), intense and uniform dyeing, improved strength, short and dense nap in suede leathers; and improved strength and nap in finished leathers.

Tuftan also saves considerable wastage, with reduced chrome content and reduced dye in the exhaust liquor. The best results are obtained when Tuftan is used between two feeds of chrome, amount is one-third the quantity of chrome. The product has been commercialised and marketed already.

-- P.T.I. Science Service, Dec. 1-15, '89

IICT DEVELOPS NEW ANTI-CANCER DRUG

The Indian Institute of Chemical Technology in Hyderabad has developed the know-how for the synthesis of etoposide, recently introduced as an anti-cancer drug for use in lung and te ticular cancer. Etoposide is a sem synthetic derivative of the potent an mitotic natural product podophyllotox which can be isolated from Podoph lum emodii, a plant of Indian origin, a from P. peltatum which is found North America.

While P. emodii was known for ce turies for containing medicinal com pounds, P. peltatum was used by t 17th century American Indians as remedy for cancer. Although repor appeared in the late 1940s and 1950s the antitumour activity of podophylk oxin, the drug could not be used becau of its unacceptable gastrointestin effects.

Etoposide acts through an oxidatio reduction process involving oxygen-fr radicals. It shows selective cytotoxici to normally oxygenated cells in vit and when combined with an oxyge carrying perfluoro chemical emulsio the antitumour activity and therapeu efficacy of etoposide are enhanced. St dies on human leukemia lymphoblas indicate that the primary effect of t compound is on DNA. Inhibition DNA repair enhances cytotoxicity. T mechanism based on DNA damage attractive because DNA is a target f many antitumour agents.

IICT has now successfully develop a process for conversion of podophy lotoxin to etoposide. The work w sponsored by M/s. Cipla Ltd., Bomba which is taking steps to scale up ar commercialise the product.

Etoposide is being widely used ho in Europe and the U.S. as an anti-canc drug. It is containing mainly distribute in the form of vials 100 mg of the dru each costing approximately Rs. 4 is administered intravenously and terminal half-life is 11.5 hours. The dr is also available for oral use in the fo of capsules, but the absorption is er tic. Unfortunately, the liquid preparat has a very unpleasant taste and is

to many patients. The
mpany hopes to export the
modii is easily available in
ayan belt and Kashmir

ience Service, Dec. 1-15, '89

EW COMBINED CYCLE TRATION PLANT

ctive utilisation of low-grade
ndian coal, the Bharat Heavy
Limited (BHEL) has set up
coal-based Combined Cycle
tion Plant (CCDP) at Trichy.
ned cycle concept appears to
t promising option for estab-
proved power generation sys-
dia, particularly for utilisation
ade, high-ash coals, as the
nal steam power plants' effi-
s more or less stagnated.

ycle, which combines two
namic cycles — the gas tur-
and the steam turbine cycle
rs more energy from the fuel
r of the two cycles operating
ntly. BHEL's plant in Trichy
n moving-bed coal gasifica-
ology and comprises a gasi-
clean-up, gas turbine, waste
r and steam turbo generator.

its higher overall thermal
, the combined cycle offers
her advantages — it causes
pollution by dust and nitro-
s; it requires less water per
ectrical output; has a quick
nd less cost per KW and the
c operates independently for
s.

ving-bed coal gasification
prises the gasifier, indigen-
igned by BHEL, and a gas
ystem comprising heat recov-
et scrubbing of gas. The gas-
ts component systems include
ck, gasifier shell with an ash
m separator drum and inter-
gasifier is a double-walled
th the coal distributor located at the top section and the grate located at the bottom section. The annulus filled with water forms the jacket boiler. The clean-up section comprises the gas cooler, quench vessels, venturi scrubbers and knock-out drum.

A new method developed for the ignition of coal in the gasifier has eliminated the need for a naked flame or burning of wood chips and coke for start-up. Only air and steam ignite the coal at low bed temperatures in the range of 70 to 100 degrees Celsius.

Coal of size 6 to 25 mm is gasified in a three-diameter gasifier by a mixture of air and steam at a pressure of 10 atmospheres. Air is supplied from the gas turbine compressor and steam from the waste heat boiler. The resultant coal gas leaving the gasifier at 540 degrees Celsius is cooled in the gas cooler to 350 degrees Celsius by exchange of heat with the steam generated in the waste heat boiler. The steam entering the gas cooler at around 250 degrees Celsius is superheated to 360 degrees Celsius.

The cooled gas further passes through a quench column where it is cooled to 100 degrees Celsius and stripped free of tar by circulating tar oil, a by-product obtained in the gasification plant. Finally, the gas is scrubbed free of dust particulates in a series of venturi scrubbers, before being used for power generation.

The gasification plant can handle about 150 tons of coal per day and generates around 13,000 cubic metres of gas per hour, with a heating value of 1200-1400 K Cal per cubic metre. The clean gas, free of tar and dust particulates, is burnt in the combustion chamber of the gas turbine and the flue gases obtained are expanded in the turbine. The gas turbine generates 4 MWe of power.

The exhaust gases from the gas turbine, at around 490 degrees Celsius have enough recoverable heat energ
and are led into the waste heat boiler t
generate steam. The steam is superheated to 360 degrees Celsius by hea
exchange with hot coal gas. Part of th
superheated steam is supplied to the gas
ifier and the rest is expanded in th
steam turbine.

– P.T.I. Science Service, Dec. 1-15, '8

EDIBLE OIL FROM FUNGI

Researchers at the Defence Foo
Researchers Laboratory (DFRL) i
Mysore, Karnataka, have identified a species of fungi as a potential source of edible oil. The oil synthesised by the fungus, *Fusarium pallidoroseum*, resembles olive oil in its chemical composition, according to DFRL scientists.

The DFRL researchers have screened nearly 20 species of fungi over the past two years in a programme to look for microorganisms as an alternative to seeds in the production of fats and oils.

Under optimum conditions, the oil yield from *Fusarium pallidoroseum* is nearly 38 per cent, which compares very well with the oil output from various oil-producing seeds, DFRL scientists said. The oil available from groundnut is about 45 per cent, while the oil palm, the coconut and the soyabean each have yields less than 20 per cent of the seed mass.

The DFRL team led by Director Dr. R. Sankaran has also developed a rapid and simple staining technique to detect the onset, accumulation and termination of oil synthesis in the fungal mycelium.

The measurements done through this technique are as accurate as those done through conventional gravimetric measurements. But while gravimetric measurements take 12 hours and involve harvesting, drying and extraction of the fungal mycelium, the new colorimetric test takes only about 30 minutes.

– P.T.I. Science Service, Dec. 1-15, '89

BIOGAS FROM ALKALI-TREATED CROP RESIDUES AND CATTLE WASTE

Anaerobic digestion of alkali-treated plant biomass together with cattle dung not only improves biogas production, but may also help solve the problems of pollution and plant disease development, recent research indicates. Microbiologists from the Haryana Agriculture University, Hissar, say waste plant biomass along with cattle dung can, in the absence of air, generate more biogas with increased methane content. The scientists, G.H. Hassan Dar, S.M. Tandon and R. Singh reported their findings in the journal Plant Sciences.

Biogas technology has emerged as one of the most promising answers to the problem of renewable energy sources in developing countries. Plant biomass like leaves, straw, culled fruits and oil cakes have been used with limited success for production of methane. Scientists have tried various methods to improve biogas production, of which chemical treatment with alkalies or acids have been found to be the most effective and economical.

The Hissar scientists co-digested various plant viruses like leaf litters of apples and peaches, wheat straw and residues of lantana plant with cattle waste under anaerobic conditions in batch digesters, at a temperature of about 30 degrees Celsius. The biomass was pretreated with 1 per cent alkali solution (sodium hydroxide).

Chemical analysis showed that degradation of organic matter in the crop-cattle waste mixture was 55 to 60 per cent compared to 46 per cent in cattle waste alone. The digestion efficiency and gas productivity of the various substrates was also higher compared to cattle waste.

Initially, the biogas comprised mainly of carbon dioxide, but as digestion progressed the proportion of methane steadily increased. The methane content was higher in the mixtures than cattle waste alone.

-- P.T.I. Science Service, Dec. 1-15, '89

TRAINING COURSE IN FRAGRANCE AND FLAVOUR TECHNOLOGY

The Bombay University Department of Chemical Technology (BUDCT) is introducing two courses, one short-term and one long-term, in fragrance and flavour technology to bridge the gap between Indian and western know-how in the field.

Research and development in the Indian perfume and flavour industry was restricted to the small-scale sector which had few facilities for in-house research. And, inspite of its ancient heritage in fragrances and flavours, India was overtaken by Japan, the United States and West European countries which introduced modern physical, chemical and engineering sciences, as well as highly sophisticated instrumentation and methodologies.

In a bid to bridge this gap BUDCT, in collaboration with the Perfumes and Flavours Association of India (PAFAI), has established the Perfume and Flavours Technology Centre at the university. The centre has constituted a syllabus for a six-month short-term certificate course and an 18-month long-term M.Sc. (Tech) course in perfumery and flavour technology. The first batch of four students will be admitted in 1989-90 for the M.Sc. course, while 20 students are already undergoing the six-month course from July this year.

The syllabus covers a wide range of topics drawn from both organic chemistry and chemical engineering and technology, Dr. Ramesh Y. Mantri, a perfume technologist from Bombay told the 11th International Congress of Essential Oils, Fragrances and Flavours in New Delhi in November. The long term course covers instrumentation methods for perfumes and flavour analysis, their formulations, and chemistry separation processes and sensory evaluation.

The short-term course is being primarily introduced for people in the perfume industry and also includes study of legal aspects in the use of the technology and elementary biotechnology for perfumes and flavours applications. PAFAI members can use the centre for standardising and developing various perfumery and flavouring materials. Industries can also sponsor research projects at the centre, and the results of the projects will be available exclusively to the sponsors.

BUDCT is also planning to introduce a full-fledged division of perfumery and flavour technology to admit students to a B.Sc. (Tech) course, Dr. Mantri said.

-- P.T.I. Science Service, Dec. 1-15, '89

NEW TYPHOID VACCINE MARKETED

A new typhoid vaccine is now being marketed in France. According to a French CEDUST release, the vaccine costing the equivalent of Rs. 225 requires only one injection. It is claimed to be better tolerated than the conventional TAB vaccine, requiring three injections and a booster shot with an efficiency of 60-70 per cent, the release said. The new vaccine is also advantageous as it can be combined with other vaccines such as polio and tetanus.

It has been developed on the basis of the principle of utilising a part of the bacteria, reaffirming the vaccinal concept, based on the fact that the typhoid fever is not a diarrhoeal disease but a septicaemic infection and that the element used for the vaccination (capsular polyoside) is indispensable for the survival and multiplication of the bacteria in blood, the French release said.

-- P.T.I. Science Service, Dec. 1-15, '89

Chemical News from Abroad

NGEMOUTH EXPANSION S BP BOARD GO-AHEAD

Board approval has been granted £560m ($879) expansion of its gemouth, Scotland, refinery and chemicals complex. Of the total, m will be sent on the previously unced expansion of the 270,000 ear ethylene cracker, while £310m go on the enlargement of BP Explo- n's Kinneil oil and gas separation from 4000 ton/day to 6000 lay.

e cracker expansion will involve onstruction of new furnaces, gas pression, and some distillation and ration units, bringing the capacity 00 000 ton/year. Completion was nally scheduled for end-1992; how- the new date is mid-1992. The pro- is still subject to the approval of ant authorities.

sic process design has been carried by Stone & Webster which will ly the technology. Contracts for led engineering are expected to be ded in December. Originally, BP three contractors would be asked d. The project will be managed BP Chemicals' Grangemouth pro- office.

e expanded cracker will use light ocarbon feedstocks, including LPG thane, from the expanded Kinneil ty. The unit will be highly feed- flexible, according to BP, ena- it to "play the oilfields" Over 100 ent of the Kinneil expansion will to chemicals production.

e Kinneil expansion will involve stallation of an additional gas pro- ng train to remove the gases from ning crude oil, together with some lary work to increase the capacity e Forties landline and crude oil t facilities. This expansion follows xploration's decision in June this year to replace the existing Forties offshore pipeline next year with a £162m larger diameter pipeline.

The new pipeline will increase capacity of the Forties System from 630 000 barrel/day to 900 000 barrel/day. The Forties system acts as a third party collection system for small fields in the North Sea.

Planning permission for the Kinneil project was granted in 1988. However, the project is still conditional on consent from the UK secretary of state for energy. Preliminary design engineering work was completed at the end of 1988 and detailed design contracts are expected to be awarded early in 1990, with construction contracts following early in 1991. Construction is scheduled to begin in 1991 with completion by end 1993. The project will be managed from BP Exploration's European headquarters in Glasgow.

The entire expansion programme is aimed at avoiding the import of ethylene and export of LPG, and will enable BP to produce polyethylene "with a considerable logistical advantage", said a BP spokesman.

BP is currently expanding PE production at Grangemouth with a 250 000 ton/year hdPE unit for completion by end-1989 and a 125 000 ton/year linear low density gas phase PE plant, for completion by the end of Q1,1990. Foster Wheeler is the contractor for both plants which will bring BP's total PE capacity at Grangemouth to 375 000 ton/year by end-1990.

GERMAN RESTRUCTURING AT SOLVAY

Belgium's Solvay has announced the restructuring of its operations in West Germany in a move that will provide tax advantages for the group and yield "significant financial resources" for the parent company.

It has set up Solvay Deutschland, a new holding company effective from 1 January 1990 which will take over sole management responsibility for Solvay's German subsidiaries. It will acquire from Solvay its 57.7 per cent stake in Deutsche Solvay-Werke, yielding a capital gain of at least BF30bn ($776m) for the parent company. This will be used, amongst other things, to fund the BF17bn investment programme the company has planned between 1990-92.

The acquisition is to be funded around 30 per cent by capital and 70 per cent by borrowing, taking advantage of the low interest rates in West Germany. The company will also transfer the tax liability of its operations from Germany to Belgium where they will be taxed at a lower rate.

As a result of the move, Solvay Deutschland will indirectly control Kali-Chemie, in which Solvay currently has a 89.7 per cent holding. Solvay Deutschland will also offer to acquire the remaining shares in Kali-Chemie for DM550/share ($299) involving a total of DM170m. Although this amount is above that recommended by experts and higher than the average market price of Kali-Chemie's shares in 1988 and in the first eight months of 1989, it is below the speculative levels of the last few weeks. The market value of the shares reached DM660 before trading in the shares was suspended pending the announcement.

West Germany is Solvay's second largest market after France, ahead of the US.

ISRAELIS DEBATE I-C-L PRIVATIZATION

A national debate is taking place over whether the Israeli government should go ahead with its privatization scheme for Israel Chemicals (I-C-L). The chairman of the Knesset finance committee and the chairman of the I-C-L board are both opposed to the proposed sale to foreign investors.

A list of bidders has been compiled by First Boston international specialists, but senior members of the Knesset finance committee have said they will make every effort to block the sale when it comes up for approval.

The Knesset's finance committee chairman believes if I-C-L falls into the hands of a foreign firm it could run the risk of being totally rationalized and have its investment plans cancelled.

However, the director of the government corporations authority has dismissed these suggestions by claiming that the government, in addition to its 50 per cent share of I-C-L, will hold a "golden share" granting it the right to the control major decisions.

Meanwhile, Canada's Belzberg family, whose personal assets are estimated at $5bn, is one of the candidates on the short list to purchase I-C-L. In response to this bid the government corporations authority said it would prefer to sell the company to an international chemicals company in order to achieve access to new markets and technology.

FERTILIZER CUTS AT NORSK HYDRO

Following Hoechst's withdrawal from fertilizer production, Norsk Hydro has announced plans to rationalize its fertilizer operations in West Germany.

The production plants at Herne, which manufacture calcium and ammonium nitrate, are scheduled to be closed by 1990. The head office at Bochum will also be closed over the next two years, concentrating all Hydro's production in West Germany at Brunsbuttel.

Meanwhile, Kemira has cancelled plans to open a phosphate mine and beneficiation plant at Sokli in north-east Finland. A spokesman for Kemira said on the basis of its latest feasibility studies it would not be economically viable to pursue the project.

However, if structural changes take place in the supply and demand of phosphate, the project may be reviewed, although this could be as far away as 5 to 10 years.

FRENCH INDUSTRY MULLS STATE RESTRUCTURING

The final version of the restructuring of the French state-owned chemical industry is expected to be known shortly. Silence on the part of the government and group leaders on the subject has sparked off much speculation and a number of restructuring versions have been quoted in recent months.

A spokesman at the industry ministry reminded that in a recent interview with the economic daily Les Echos, the minister indicated that nothing would be settled before the year-end. However, he added, that the final decision, currently being prepared by the government in cooperation with the chemical groups' leaders, would be known within the next 10-12 days.

The industry ministry spokesman indicated that it was an overall plan "that had its coherence." The whole aim of the regrouping is to reinforce both national oil companies Elf Aquitaine and Total CFP and to boost the chemicals industry, not weaken it. The government, he added, could be relied upon to see that the restructuring did not involve too many job losses.

This is one of the areas that is worrying the trade unions, otherwise divided on how the restructuring should be carried out. Mainly concerned in the regrouping are Orkem, Enterprise Minere et Chimique (EMC) and Societe Nationale des Poudres et Explosifs (SNPE), which are likely to be shared out among the two oil companies.

The trade unions say
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such as rubber, solvents

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SULZER ACQUIRED LICENCE FOR ENVIRONMENT-COMPATIBLE FLUE GAS DENITRIFICATION

The Thermal Power Systems Division of Sulzer Brothers Limited, Winterthur (Switzerland), has acquired a licence for the denitrification of flue gases from boiler plants after successful negotiations with Exxon Research + Engineering (ER+E), Florjham Par, New Jersey (USA). The process, which is the subject of this licence, is based on the discovery patented by Exxon that ammonia or compounds containing ammonia react with the nitrogen oxides in flue gas without additional catalyst in a temperature range between 700 and 1100°C, making the flue gas unobjectionable to the environment. This non-catalytic process has been employed with success in the USA for several years now, in boiler plants serving chemicals, industry and refuse incineration. With its new licence, Sulzer has acquired the know-how for designing, dimensioning and operating denitrification plants of this kind.

The decades of experience gathered by Sulzer in the engineering of boiler and process plants constitute a guarantee that the potential for possible process improvements will be exploited. The acceptance by Exxon of Sulzer's demand for the right to sell its own process improvements also to third parties was influenced to a considerable extent by the good results measured on the Sulzer pilot plant for nitrogen oxide reduction at the Ibach refuse incineration plant near Lucerne.

By virtue of its modest space claims and structural outlay, the process is suitable, above all, for quick retrofits on existing boiler plants. Thanks to the specific boiler design in refuse incineration plants, nitrogen oxide emissions below 100 mg/Nm^3 can be attained. This complies with the limit stipulated by the Canton of Zurich for 1994.

PROPYLENE GLYCOL USP
EPICHLOROHYDRINE
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91 & 96%
TWEEN-80
HYFLOSUPERCELL - USA
P.E.G. 4000 & 6000
STYRENE MONOMER
ROSE CRYSTAL
ISOPROPYL CHLORO
ACETATE
GLYCERINE USP
LACTOSE IP/BP
TITANIUM DIOXIDE RCR2
BUTYL CELLOSOLVE
N. BUTANOL
DIMETHYL SULPHOXIDE
METHYLENE CHLORIDE
PARA CRESYL PHENYL
ACETATE
METHYL CHLORO ACETATE
MANNITOL USP
MELAMINE
PHENOL USP
CYCLOHEXANONE
TUNG OIL – CHINESE
DIMETHYL FORMAMIDE
SOYA LECITHIN
CYANAMIC ACID
TRICHLORO ETHYLENE
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Chemical Markets Abroad

ACRYLO Q4 CONTRACTS REFLECT SLACK MARKET

Acrylonitrile quarter four contracts have finally been concluded, after lengthy negotiations. A price of DM 1350-1450/ton is the accepted range, representing a fall of DM 150-210/ton from quarter three numbers. The absence of a market leader has hampered the emergence of a definitive range.

One area of uncertainty, which has delayed any agreement, is the unsettled question of propylene feedstock costs for quarter four. Although initial contracts were settled in September, at DM 750-725/ton, agreements have been revised down to DM 700/ton. The first contract of DM 650/ton has recently emerged, while some players have still not settled. In spite of this volatility acrylonitrile players have concluded their deals. One player commented: "Even though no firm propylene number is agreed, a directional trend has been established.

The acrylonitrile and acrylic fibre markets have been weak throughout 1989. Buyers appeared in no hurry to settle contracts, preferring to keep production at the reduced summer levels. In light of the depressed market, neither buyers or sellers appear totally happy with the current contract settlement.

A lack of acrylic fibre export opportunities is having a major dampening effect on the acrylonitrile market. One good example of this is China, according to consultant Simon Garmston of Petrochemical Consultants International (PCI). China imported 330,000 ton of acrylic fibre in 1988, this has been massively reduced to 80-100,000 ton for the whole of 1989.

In the case of acrylic fibre, high [illegible]

[illegible] malaise is the cause of China's diminished purchasing of acrylic, say PCI.

With regard to China, 1990 may present a different scenario. Many producers expect China to re-enter the acrylic fibre market in 1990 as a major buyer, thus helping the revive trhe acrylonitrile sector. It is generally agreed that China's inventories are heavily depleted, forcing purchases in acrylic fibre if demand is to be met.

In a note of caution, observers say factors such as the lack of foreign currency, the economic slowdown and political uncertainity could affect China's performance.

Far Eastern quarter four acrylonitrile contracts are largely outstanding. A number of smaller settlements have been concluded at $620-630/ton cif Far East. However, major players are still negotiating. Buyers want numbers well below $600/ton cif Far East, while sellers hope to achieve numbers around $650/ton cif Far East.

In response to slack demand, acrylic fibre producers in the Far East have cutback production. Taiwan and Korea are said to have reduced output by 4-5 percent in the second half of the year. Japan's production figures are down 10 percent on last year's levels

In Europe imported T1 product looks set to further undermine prices. Imported material is being quoted at $570-590/ton cif NWE, with numbers down at $550/ton cif NWE being talked. This means that even with the 13 per cent import duty, deep-sea material vastly undercuts the fourth quarter contract price.

Until recently T1 prices plus duty were not that economically viable in Europe, this is now changing. Players have expressed concern about the effect of [illegible]

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BP GRANGEMOUTH

Grangemouth, Scotland is one of only two places in Europe with indigenous hydrocarbons for processing, according to Ray Knowland, BP Chemicals Managing Director, commenting on the BP board's approval of a £560m investment at the site.

Knowland describes the expansion of Grangemouth ethylene cracker as a "genuine brownfield project", and certainly "not a hole in the head" for the European petrochemical industry. He believes the project is most definitely not "a new cracker", but given the size of the investment, £250m, " it would not stretch credulity to describe it as debottlenecking." It is an "extreme version of capacity creep," he said.

INDUSTRY EXPLORES NEW CHEMICAL/REFINERY SYNERGY

The Chemical Industry is exploring new methods of cost efficiency and alternatives to the traditional refinery sourced feedstocks used in the production of light olefins and aromatics. One development involves the creation of strategic partnerships between refineries and chemical complexes, as described by E. G. Clinckspoor, feedstock and fuels manager at Exxon Chemical International, at the recent CAPPRI meeting in Houston.

The high profits enjoyed by the chemical industry over the last two years have made it less necessary for companies to actively seek methods of cutting feedstock costs.

However, recently smaller profit margins have given the industry the incentive to rethink feedstock strategies and to examine how synergies between refineries and chemical complexes could have distinct comparative advantages for the production of basic chemicals.

Exxon estimates the non-communist world's consumption of naphtha amounted to 2.1m barrel/day in 198 and that this will increase by 50 per cent to 3.2m barrel/day by the end of the century. Over the same period consumption of LPG is forecast to rise by 25 per cent from 1.4m to 1.8m barrel/day and consumption of middle distillates by 60 per cent from 0.3m to 0.52m barrel/day.

Demand for natural gas liquids is expected to rise by about 1.4 per cent/year over the same period, reaching almost 5.5m barrel/day by 2010, an increase of more than 1m barrel/day.

In terms of demand for both petroleum and gas feedstocks, chemicals growth can be seen as exceeding that of GNP and as much higher than that of supply sources. This implies a substantial increase in the chemical industry's offtake of available supplies and a significant disparity between the growth in demand for chemicals and fuels, particularly with regard to naphtha.

At present, the major basic chemicals producing areas Western Europe, Japan, Asia Pacific and the US and Canada import LPG at rates varying from around 0.1m ton/year for Asia Pacific to 12m ton/year for Japan. By 2000 each area will have increased its imports by around 3m ton/year.

Western Europe, Japan and the US and Canada currently import naphtha at rates of 16m, 18m, and 5.5m ton/year, respectively. Asia Pacific, however, produces a surplus of 7m ton/year of naphtha. By 2000 naphtha imports in the West and Japan are forecast to be slightly lower than their current rates, implying that supplies of naphtha will have become more scarce.

Obviously it would be to Asia Pacific's advantage to use its surplus naphtha in the production of petrochemicals, therefore it is expected that the surplus will [illegible] and demand despite only a minimal growth in the use of naphtha in fuels.

This raises the question of whether industry will become dependent on naphtha feedstocks imported from the Middle East and the Eastern bloc.

At present naphtha is exported to the US from the Middle East; petrochemicals from the US to Asia Pacific; and industrial products are sent back from Asia Pacific to the US.

However, Exxon, claims that it and certain other companies have developed technologies to produce petrochemicals from natural gas which have not yet been put into use.

Although such technologies would prove extremely cost-effective as long as the prices of traditional feedstocks remain high, they are regarded as high risk investments and their development will be cautious. Significant production is not expected until around 2010.

Moreover, gasoil has already been used as steamcracker feed for short periods and is expected to become more attractive, as will a wider and more cost-effective variety of feedstock. The major advantage of a refining-chemicals synergies is feedstock diversity.

At present independent steamcrackers are restricted to commercially traded oil feedstocks such as LPG and naphtha. Various other factors make synergies, potentially, extremely cost-efficient. The recovery of refinery olefins and aromatics is easily justifiable if they can be used within an integrated complex by a ready-made customer.

Similarly, advanced refineries have [illegible]

ufacturing processes, including steamcracking, cat-cracking, reforming, alkylation, isomerisation and MTBE.

It is also prominent on the product side between chemicals and fuels. Integrated refinery and chemical complexes would utilise the synergy between gasoline and chemicals to obtain maximum efficiency in terms of supply and demand, product quality and environmental responsibility.

Product quality targets can be achieved through a coordinated use of different processes. For example, Exxon claims to have raised the octane level in its premium unleaded gasoline whilst increased production of propylene, butadienes, benzene and xylenes and enjoying very high profit margins.

PROPYLENE CONTRACT BREAKS LOGJAM

Propylene may be seeing buyers reap the benefits of bearish market perception, despite restart delays experienced by major producers.

A contract for Q4 1989 and Q1 1990 combined was concluded, the market believes it to have been at DM 650/ton.

While this resolves what was probably the most keenly observed outstanding negotiation, it is still too early to make a firm judgement of the deal's strength as an indicator. With negotiations having extended so late into Q4, the attractiveness of a settlement for two quarters is increasing. The potential message of this combined contract is that producers may have to brace themselves for lower numbers still next quarter.

However, this [illegible]

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Distribution and utilisation of natural gas*

F.D. WILSON, CEng MLGasE
British Gas Plc.

n

ast 25 years the gas industry in Britain has seen ges. Not in its basic aim of providing a comin, on tap fuel but in the sources of supply, its hnical approach to meeting demands and in its s. This paper deals mainly with developments taken place within British Gas and will cover planning and design, particularly concerning the puters and network analysis. It will go on to e of the new methods used in distribution, instalaintenance. There is a brief reference to recent ts in gas utilisation technology.

s in Britain

round, it is worth briefly reviewing the history al gas industry in Britain. Up to the mid-1960's stry had been reliant on coal carbonisation but nced a move towards oil based feedstocks. th the importation of LNG from Algeria and an arketing policy, some demand growth had been

th accelerated rapidly with the discovery of natthe North sea. Over the three years to 1970 all British Gas were connected to the Natural Gas n System and conversion of some 35 million o direct natural gas supply was well under way. rapid and demand has increased to reach over ubic metres per year in 1986/87.

now 17 million gas consumers and the annual 1987/88 was £7.4 billion (US $ 13.3 billion). At cement of conversion there were 170,000 km of st a current total of 240,000 km of which 22 per polyethylene and 8 per cent high pressure steel n pipeline. The organisation of the company ountry into geographical areas with the customectly supplied from the main systems of the 12 idiaries. The maximum demand on a single day tal of 320 million cubic metres in 1987.

t National Transmission System, together with terminals, grouped at five locations, receives gas ntracted fields. There are seven storage facilities million cubic metres of liquefied gas and 125 ic metres in leached salt cavities on the east

Basis for system design and planning

Having briefly indicated the state of the natural gas system in Britain at present, it is now proposed to consider som of the factors which are used as the basis for design. With the advent of natural gas, the priority in the early years wa to obtain a return on the high capital investment. Initially supplies were directed to the existing gas making plants for use as feedstock and to bulk energy users in manufacturing, chemical feedstocks and power stations.

This approach was complemented by investigation into the fuel markets and studies of how particular market sectors could be developed most profitably. In Britain the premium markets are now the firm residential and commercial loads where the convenience of gas has a potentially higher value. Some larger manufacturing loads are retained but power stations have not continued to be supplied with natural gas. This change arose from the European perception of gas as a specialised fuel to be considered for premium uses. However, with recent economy changes there are indications that supplies to power stations will again be considered. Of the annual sales, 54% is domestic, 15% commercial and 31% to industry.

In Britain demand is sensitive to cold winter temperatures and the maximum demand, especially domestic load, occurs in the winter for heating. For modelling purposes this is difficult to manipulate and daily demands are re-ordered in decreasing size to give a load duration curve. For British Gas, two criteria have been adopted as a basis on which demand predictions are made:

1. that daily capacity should be sufficient to meet a demand encountered once in 20 years,
   and
2. that the volume of stored gas should be adequate to meet a duration of demand arising once in 50 years. For National System design this criterion is the more critical.

These two criteria have developed as a result of many factors, some of which can be mathematically manipulated, such as

- — the past records of weather severity and gas demand variations.
- — the capital and running costs of plant and equipment.
- — the evaluation of errors in forecasting.
- — the cost of handling a failure and restoring supplies.
- — the cost to the customer from lost output if gas supplies fail.

---

nted at Oil, Gas and Petrochemical Seminar in January 1989.

Other factors can involve a large measure of judgement:
— customers' expectations of reliability
— the previous history of supply failures.
— what is regarded as the extent of acceptable failure and the possible safety risks involved.

Daily demands

For the design of local systems it becomes even more important to know the load characteristics of different types of customer if the most economic design is to be achieved. To this end, British Gas has regular winter recordings made of a sample of customers' demands based on 6 minute interval measurements. These load surveys, for example, are used to examine the effect of changing house designs on customer demands. This information becomes significant when planning the mains layout to a housing estate.

None of these examples have a continuous load through the day and each, therefore, demands a level of diurnal storage to encompass these changing rates. Fig 1 shows the volume of storage required by a typical day's profile of demand. For Britain, the diurnal storage volume is about 20% of the day's demand, comprising 15% for the hourly demand variations and 5% for operational needs such as demand forecast errors and plant outage. Industrial customers may range from requiring virtually no storage if demand is on a continuous 24 hour basis, to 60% of the day for single shift working. To reflect these hourly rate changes onto the supplying fields would not be economic and it is usual to provide storage local to the point of demand to absorb the variations. For British Gas a large proportion of this storage is provided by low pressure holders existing from the town gas era. But cost
makes construction of similar vessels
new storage capacity is designed into
as they arise with the transient flows be
tuations in the operating pressures. Both
storage are used to a limited extent to
age cover. Fig. 2 shows the relative co
age from the various sources and that
additional capacity are linepack with
providing some capacity for relatively

Network analysis — The planning

A transmission and distribution syst
work of pipelines and may also hav
equipment such as compressors and re
gas from the supply fields across the co
and cities at progressively lower operati
individual customers are supplied with g
or contracted for. Many of the loads
through an existing network of pipeline
essary not only to design new network
to predict the impact of new loads on th
to propose ways of reinforcement should

Before any analysis is undertaken,
the appliances to be supplied is carrie
required maximum hourly rate of gas c
the customer proposes to operate t
Assessment of an industrial or comme
the installed equipment rating, but d
loads such as housing estates, new tow
more difficult to quantify and it is now
surveys become of value. Factors to b

TYPICAL STORAGE REQUIREMENT FOR A WINTER'S DAY DEMAND

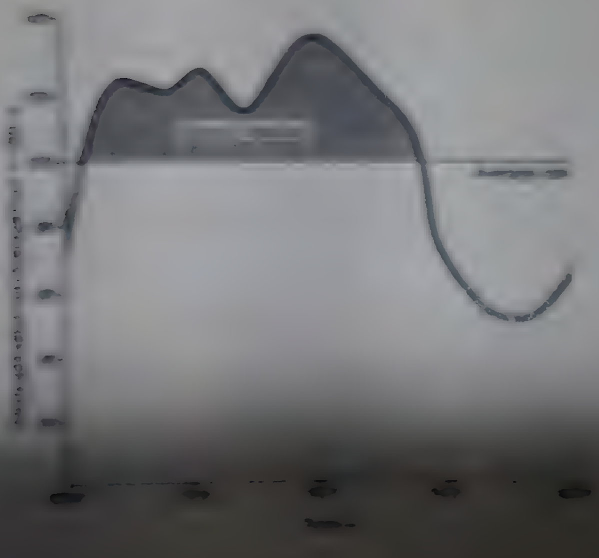

Figure 1

CUMULATIVE COST PER AN
PROVIDING 1000 m³ OF ST

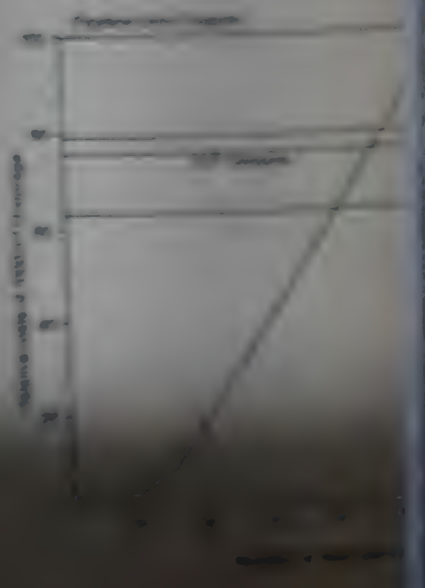

Figure 2

in the locality taking gas
s and the corresponding demand

ased on annual sales to houses
heating equipment.
mand of a development site. This
enetration of gas into an area is
s undertaken by the marketing
making provision for future mar-

initial and ultimate loads sought
mum acceptable pressures, eva-
most economic means of supply
le gas supply system to a greater
on the available capacity in that

as transmission or distribution
able to predict the behaviour of
to calculate the pressure loss
ny given combination of initial
diameter. To be able to calculate
pipe, a hand calculator is suffi-
d networks a computer is essen-
of calculations to be carried out.
f programs developed in-house
s networks both in steady-state
athematical formulae that have
n mainframe computers for the
s in current use in PAN. This pro-
y be superseded by FALCON
age of running on a variety of
g additional analysis features.
lable - STAG, an enhanced ver-
lan the National Transmission
models medium and low pres-
e and SNAP, predominantly
networks, e.g. housing estate

the behaviour of gas sources
re reduction stations depending
ressor stations, regulators and
S, ALCON and STAG programs.
ded and within-day changes
n be evaluated.

techniques, engineers are able to
pansion and assess the available
financial terms. These model
component specification [illegible]
variations in phasing. [illegible]

the analyses, technical information is provided to other departments to enable compressors, regulators and associated plant to be correctly sized, or modified if appropriate for changed circumstances.

For small extensions and pipe layouts an initial output and pipe sizing can be predicted by inspection and analysed to optimise the detail. Where the design is for a large complicated layout, the pipe routing and the location of loads is fed into the computer which automatically sizes all the pipe lengths by sequentially increasing the diameter of the most highly loaded pipes until terminal pressures and the pressure drop are satisfactory.

This result then becomes the basis for cost estimates and for providing quotes for contributions from the developer of the estate or the industrialist. An advantage of this type of computer analysis is that the finalised design can be stored on disc and retrieved should, for instance, further developments be planned, a change in estate layout be proposed or an assumed pipe route not be available. The new information can be superimposed on the original design and the effects easily seen, so allowing reinforcement, enhancement or a revised pipe configuration to be assessed and incorporated in the final design.

Investment decisions

It is appropriate to mention investment at this point because the key factor in designing new systems or renewing and modifying existing systems will be the availability of finance.

As a general principle, all new investment should be profitable, either direct or by reducing costs. The incremental investment and cash flows should be discounted at a specific test discount rate to give a positive net present value. Because British Gas is an integrated industry there is one discount rate for all the gas supply business. (This may not necessarily be appropriate for separate and competing production, transmission and distribution companies where individual market risks may be assigned to the different sectors.)

The following general comments apply to the cash flow projects:

1. We are concerned with the marginal investment and the incremental cash flows which arise from that investment.
2. Investment in gas supply is long term:

— in the domestic market demographic and housing changes take many years to have a significant effect on energy consumption
— industrial and commercial customers may [illegible] quickly [illegible] changes [illegible]
— the normal gas supply [illegible] period is [illegible] years [illegible] may be [illegible] for shorter periods

3. Taxation is included, as similarly are any government assistance grants if they are available.
4. British Gas uses a real discount rate — i.e. constant price levels over time.

These rules apply equally to extending the supply to an existing town or village, to a new housing development, to an industrial estate or to an individual industrial customer. The same principles also apply to any other investment — a grid control system, a computer, a retailing showroom etc., although the appraisal period would take into account the specific economic life of the project.

In a new supply situation, the first and most significant task is assessing the potential load and the timing of load build-up. Here, two factors are important — the annual load and the peak load. These, as referred to earlier, dictate the mains size and any storage requirements and could also impact on the annual and peak matching of supply and demand and may have an effect on the cost (or selling prices) of gas.

When attempting to forecast cash flows as far ahead as 20 years, there are many uncertainties around a "central case" projection. Discounting does "down grade" the later years' cash flows, but sensitivity analyses are also employed. These give two indications — the size of the range of possible outcomes and, by assigning probabilities to each variable, the most probable outcome. The sensitivities used in an individual appraisal would vary depending on specific circumstances, but could include:

- oil prices, especially if purchase contracts or selling prices are oil-price related.
- other relevant costs — e.g. steel, manpower.
- sales — volume, growth per annum, gain or loss of major contracts.
- foreign exchange rates.
- prices of competing fuels.

In Britain it is standard practice to obtain a contribution towards the cost of connection from new customers and British Gas is legally entitled to do so subject to certain regulations. For ease of calculation and to assist in customer negotiations, standard formulae are applied in respect of the allowances which can be given against the total cost of supply when assessing contributions from new domestic and industrial customers. In respect of industrial customers, the load factor of supply is taken into account on an individual basis.

New distribution methods

The change to natural gas presented British Gas with opportunities as well as difficulties. Technical problems have had to be solved e.g. losses of gas from old distribution systems rose dramatically and required solution. New materials, equipment and methods were necessary,
been the need to find more efficient and less c
of working. A few of these developments are n

a. Polyethylene (P.E.) piping

In order to develop a system with high integr
lene (P.E.) was developed as a pipe material t
iron. Our Engineering Research Station inves
able effort into the characteristics of the vari
particularly related to resistance to stress crac
the compatibility of materials from different m
The final choice fell to a co-polymer with chain
ited branching which most satisfactorily met the
giving optimal toughness and sufficient fle
material is commonly referred to as medium
ethylene (MDPE). To complement the MDPE
Gas has now developed a full pipe jointing syste
trofusion fittings, giving repeatability of jointi
ing greater freedom to join materials fr
manufacturers. The electrofusion technique uses
ing element embedded in the P.E. fitting conne
trol box which times the heat input and ensur
welded joint. This gives a much improved jo

The use of MDPE with a minimum number
given many opportunities to develop new tec
as narrow trenching etc. and so save money. Th
of P.E. has been very rapid once the mechan
had been established. Apart from high pressure
special locations, it is the only material now

b. Narrow trenching

The facility to excavate narrow trenches al
of both excavation and reinstatement to be
narrow trenching method of excavation has led
opment of new generation of mechanical pla
to cut road surfaces and special narrow buck

c. Trenchless pipelaying techniques

Having observed the benefits to be obtaine
ing the trench width, it is apparent that by com
inating the requirements for excavation and re
ment even larger savings are possible. The mol
achieves this requirement. Moling techniques a
have been available for many years. Howeve
their use has increased largely due to the fact t
the new P.E. pipe behind them as they drive th
At present time pipes between 65 mm and 1
ters are being successfully laid using this te

A range of techniques are available for repl
mains involving either inserting a smaller dia
tic pipe into the old cast iron main, or by brea
tions of the cast iron pipe to insert a larger

a method of storing maps on magnetic
inity to plan the best route for exten-
ution network and analyse the perform-
etworks, make projections of the future
d design reinforcements and extensions
usfy the projections. The basis of the
d large scale maps being produced by
, the national body responsible for cart-
e United Kingdom.

nable existing plants to be located speed-
f repairs and alternations, and new data
kly onto existing records. They will also
ge of information between utilities and
who are planning work in the vicinity
lead to less interference with other util-

t pressure control

kage loss and associated costs in distri-
desirable to keep pressures to a mini-
el. A new computer based control system
by British Gas which continuously varies
minimise pressures at identified low
pply system under all variations in load

ule

d, packaged control module has been
e conventional above ground governor/
ons which are generally housed in
and buildings. The new control module
ate in a below-ground pit, and can be
d replaced so that maintenance can be
workshop where the unit can be dynam-
and certified. There are considerable cost
nventionally designed regulator stations
s of savings in initial installation costs,
e. There is also less impact on the envi-
kelihood of interference with the plant is

r replacement of the system is only one
h Gas policy for leakage control. Exten-
are conducted using flame ionisation
k equipment for walking surveys or vehi-
ors to identify and record any detectable
uous gas conditioning with monoethylene
ed out in all parts of the system contain-
. Improved repair methods, both internal
ing perfected. Among the most recent is
xpanding metal sleeves which can be

remotely positioned on joints from inside the mains. Another is the injection of anaerobic sealants into joints either from small excavations or from mobile pigs drawn through the main.

These and other methods have enabled us to contain the leakage problem resulting from the introduction of dry natural gas and the last few years have seen a welcome reduction in the number of public reported escapes.

Utilisation

British Gas has 17 million customers of which 85,000 are in the industrial sector and 500,000 are in the commercial sector. We supply 46% of the energy used in Britain (excluding transport fuel). It is therefore appropriate and necessary that we continuously strive for more efficient use of the energy sold and British Gas is a leader in the field of research into new and more efficient methods of utilisation.

Research work carried out within the British Gas Midlands Research Station has brought about the following developments:

a. ***The regenerative burners*** for metal reheating. These burners operate in pairs each connected to its own heat exchanger. The burners fire alternatively. Hot gases pass into the working chamber from one burner and leave via the other burner and its heat store. These burners can recover up to 90% of the available heat in the flue gases which would otherwise be wasted.

b. ***The recuperative burner*** for melting metals and heat treatment.

c. ***Ceramic immersion tube heater:*** This consists of an inner and outer silicon carbon tube with a recuperative burner firing down the centre. Rapid recirculation of the gases ensures high heat transfer and even heating along the working length.

d. ***Ceramic radiant tube heater*** used for heat treatment of metals. Fired by a recuperative burner these can be used for process heating up to 1250°C.

e. ***High velocity burners*** for heating ceramics and heavy clays. These offer an effective and efficient method of kiln and furnace heating. Hot gases emerge from the burner at high speed and create a turbulent atmosphere within the furnace chamber giving rapid even heating. This will provide greater productivity and improved product quality.

f. ***Direct contact water heating*** cold water is allowed to fall through a series of perforated plates where it comes into contact with hot gases from an immersion [illegible] in a tank at the base of the heating tower. Latent and sensible heat is revered. The temperature of the falling water is raised to /20°C. The immersion heater in the reservoir then raises e temperature to the required level. Efficiencies can be as gh as 98%.

Condensing boilers for central heating: These boilers are esigned to recover heat from the flue gases. Efficiences of 8% have been achieved with a saving of up to 26% reducon in energy use.

Many of these developments are now available through cencees.

Combined heat and power systems: British Gas has also een involved in the development of combined heat and ower (CHP) systems using both reciprocating gas engines nd gas turbines.

A typical CHP set comprises a gas engine coupled to an lternator which provides base load electricity. Heat recovred from the engine exhaust can be used to produce hot water r warm air for process or space heating purposes. The operating efficiency of these systems is usually in exce per cent.

i. ***Combined cycle power generation:*** In the past th gas for power generation has not found favour, bu developments have shown that this is a very acceptat of gas utilisation, particularly in small communitie there is an urgent need for electrical power.

Conclusions

British Gas has gone through a metamorphosis fro a gas making industry to a large direct national gas industry in a very short period of time bearing in m size of the business throughout the U.K. The comp led the way in many new developments and will c to do so in the future.

British Gas believe that India is just on the thresho their natural gas expansion and development program see an exciting time ahead for the Indian gas indus we hope that we shall be given the opportunity to h sister industry with these developments.

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t of a new plant is extremely high and many
e still running reliably with the appearance
ars of useful life. However, in many cases
ded the rise in energy prices and by today's
nergy consumption may be excessive. In
s evidence of excess capacity at some places
while the factory needs extra production. In
ions a modern "low energy" plant may have
process unit or high maintenance costs which
fecting the overall economic performance.

s out the approach recommended by H & G
ion of these problems. We are firmly of the
ernisation projects need careful thought and
art from an initial exchange of ideas to con-
hat the designer has the ability to undertake
eve that the project should be undertaken
d stages. A large part of this paper is con-
organisation of a revamp or modernisation

y available for the revamp of ammonia plant
paper. Some time is spent describing those
able for small alterations to the plant. The
aper describes how all or part of the H & G
an be applied to expand the output of a plant
hile reducing the energy consumption.

ering has carried out revamp work for such
s Norsk Hydro, ICI, UKF GSFC, BP and
ng oil and chemical companies. The revamp
executed in Luzhou, China to expand the
ammonia plant by 50% contains more new
ures in one plant than many new low energy
undertaken along the lines outlined in this
ct without the earlier study stage the client
ave accepted some of the technological
putting 30% of the feed direct to the
ner and a completely new loop designed
ba.

)N OF A MODERNISATION

vites

on of a Modernisation Programme for an
st like any other investment and operational decision in that it is to be done to increase the profitability of the organisation. It must not be seen as an opportunity to keep the engineering department busy for a while.

A modernisation project upon completion will most probably change a very well understood plant into one whose existing equipment is pushed to its limits and in which unfamiliar new technology is introduced. It must be recognised that modern ammonia plants are very integrated units and very few changes will have only minor effects on the whole. It is quite probable that the operator will very quickly find the calculation and analysis of these effects outside his capability. However before going for help there are several things the operator should do himself or contract to a specialist organisation.

Plant Audit

The existing plant should be examined in minute detail. Flowsheets should be marked up to show all modifications that have been incorporated so far. The history of all equipment must be carefully examined to identify its remaining life. If a plant is over 10 years old it is probable that a lot of drawings are out of date. At various overhauls many changes have been made some may be as small as blocking a few tubes in a heat exchanger. This information should all be brought together so that the operator himself has a clear idea of both the present condition and the potential still present with each item of equipment. He should also confirm while doing this exercise that he is operating the plant in the optimum way already. It does not make good sense to let a contract for an improvement of 6 or 7 percent if 2 or 3 percent of that could be achieved by better operation of the plant. In these circumstances the investment will be erroneously considered against too large an improvement. The performance audit should be undertaken by an outside organisation or a fresh team of people to the normal operators. It is well known that even good operators can run the plant in a way that minimises operator activity rather than always striving to achieve the most economic performance.

The audit will carefully examine the background to maintenance problems with the intention of identifying the cause rather than just the symptom. For example bearing and coupling problems with major machines may be due to piping stresses causing misalignment while the machine is hot. While shut down the loads and alignment may be perfect. An audit should identify whether this or some other external effect is the cause of the problem or whether there is a serious mechanical defect in the machine itself. This audit will take anything

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the Oil, Gas and Petrochemical Seminar, January 1989.

up to 2 months and is a worthwhile occasional exercise regardless of modernisation plans. It may be necessary to do the audit in two stages. The first while the plant is running can concentrate on establishing the best performance. The second part while it is shut down can incorporate non destructive testing to establish residual life very accurately.

Modernisation Objectives

Upon the conclusion of the audit and with certain inputs from marketing, the engineering department will need to consider the exact objectives of the modernisation project. If the capacity is not limiting then it is likely that the major objectives will be life extension, maintenance and energy reductions. If extra capacity is required then the audit is likely to have revealed how much of the equipment has spare capacity and residual life. It should be possible to produce some economic scenarios to consider the relationship between various levels of expenditure and extra profit due to cost reduction or capacity increases. This initial work will enable economic yardsticks to be established for evaluation of the subsequent work. Since the operator may not fully appreciate all the implications of the technology to be used in a modernisation program he may only be able to get approximate solutions at this stage.

The next objective must be to obtain better cost and performance data for possible improvements so that a decision can be made using the economic criteria established earlier as to what sort of modernisation project, if any, to undertake.

During the period of the audit the team contemplating the modernisation project should obtain as many ideas as possible from the original designer and others as to how the plant can be improved. Some improvements may be proprietary and possibly unavailable to the original designer. In some situations the original designer is no longer in business. Spend some time in discussion and evaluating these ideas before moving to the next stage.

Multi Stage Modernisation Design Activities

Even with a well audited plant it is not possible in most cases for a designer — contractor to make a proposal initially which would include an accurate estimate of the final cost of an optimised scheme.

H & G have now been involved in many modernisation studies and projects which were conducted in two or three stages with an appraisal step between each stage.

First Stage Study

At this stage one or several designers are invited to make a proposal for what they consider to be the best scheme to meet the objectives of the modernisation program. By this time the plant audit will have provided sufficient information for the operator to put forward precise objectives to the designers. However it is a good idea to give the designer the scope to offer alternative solutions.

Even if the proposed modification is apparently very small like adding a hydrogen recovery unit, it is still a good idea to involve an ammonia plant design organisation before making a commitment, since even this unit if properly used will change the whole flowsheet. The extent of the change will depend upon the objectives and the details of each plant.

The first study would last for 8-12 weeks and if concerned with the whole plant is likely to take the designer 1000-3000 manhours. The report should consider at least one main scheme with certain options. In this time one or more process flowschemes will be produced and ±25% estimates made of the cost. The predicted performance gain should be correct to 1-2%.

During the study most designers will welcome resident engineers from the client into their offices to assist both with philosophy and clarification. If a plant audit has not been carried out then it must be undertaken at the beginning of the study. It will add about one month to the programme and 350-500 manhours to the total plus, of course travel and other expenses. If a great deal of work is neccessary for updating drawings and data then more than 350 manhours could be required if this is done by the auditor.

Second Stage Study

This stage begins for the client with the studying of the Stage 1 report. If the recommendations are completely clear then this can lead to a decision to cancel or proceed directly into the work. H & G found in two studies that at this stage it was still necessary to proceed with caution and the subsequent work was split into two more stages.

Let us first consider the situation where the recommendations and the preferred scheme are completely clear. The client has two options. He can either negotiate with the designer who did Stage 1 or he can put the work out to tender. The latter will involve him restructuring the Stage report so that it becomes a clear enquiry document. The type of contract will of course depend on the normal business practice of the client, however unless the enquiry is completely clear many contractors will have difficulty giving a fixed price bid.

In the majority of cases the client will internally study the Stage 1 report and most probably accept a composite modernisation scheme. This is likely to be only well defined in pa and it may be wise to split the second stage into two. I first part the chosen scheme is worked up in detail and to an accuracy of ±15% using contract quality work. conclusion of this stage there is a short break to estab- at the new performance and costs give the right eco- return. If this is so then the project can continue. For over 12 years old the economic evaluation must con- benefits obtained from the additional operating life of ant. If it is still not economic then the scheme may be abandoned or modified again.

he situation when the decision is made to proceed then b will be so well defined that the contractor could give d price for the subsequent work. In a country like India f this study should be handled by an indigenous designer the subsequent work should almost entirely be done e indigenous party.

e will now return to the content of the Stage 2 first step t. It will of course contain new PFD's and mass balan- or the modernised plant. However it will also identify cessary equipment changes either by modification or cement. P & I diagrams will be marked up and all the points will be identified. A plot plan will be produced ing the location of all new equipment. It should also de comprehensive economic analyses showing DCF ounted Cash Flow) and IRR (Internal Rate of Return) es etc. Basically only detailed engineering remains to ne.

ementation

e implementation of a modernisation project is unlike ng a new plant, in that work has to be done within and side the operating plant. This means that very careful ing is required. The operating plant may be scheduled t down for annual or biannual maintenance. Work must anged so that tie-ins and modification work can be done se periods. H & G strongly recommend that the majority new equipment should be erected alongside but at a ient distance that welding and other dangerous acti- can be done without interfering with production. The aim of the planning and construction activities must ensure that final connection, testing and commission- ould be done in the shortest possible period so as to se lost production. We believe that a shut down of eks should be quite long enough for most moderni- schemes. For some situations where life extension is or consideration a longer shutdown may be necessary t more equipment can be replaced with new of higher y. The use of small modules assembled off site is like ve advantageous by limiting work on the site to equip- which cannot be moved.

nology for modernisation with little or no expansion

to now the procedure suggested can be used on any s plant. We now turn specifically to ammonia plants.

The technology for modernisation can be divided into two types, one which can be used for small changes involving little interaction with the rest of the plant, the other involves changes which may be small but have a considerable effect on the total plant operation and performance. Among the former are purge gas washers to recover vented ammonia, and drying of syngas. Among the latter are reduction in steam carbon ratio, hydrogen recovery, lower of CO_2 unit reboil and improvements to the ammonia synthesis.

Most of the technology for both types is well promoted especially that which utilised proprietary equipment like cryogenic units, PRISM and certain ammonia reactor internals. Many of these vendors have either a very sketchy or basic view of the use of their equipment. In all cases it is well worthwhile obtaining the assistance of a qualified ammonia plant designer to ensure that the best solution is obtained.

As an example we will consider a hydrogen recovery unit. This can be incorporated to achieve several objectives including increasing capacity and reducing energy. However it also introduces a degree of freedom to the plant which was not previously present. With it one obtains facilities for rejecting inerts and excess nitrogen. If the reformer heat flux was limiting any increase in output but the process air compressor had 5-10% spare capacity then the plant could be run with excess air in the Secondary Reformer to remove this limitation on the Primary Reformer. The maximum extent of any expansion will depend upon the capacity of the syngas compressor. The final optimisation can be quite complex and an organisation capable of carrying out accurate calculations quickly is required. Also a good understanding of the capabilities of rotating equipment such as most contractors have, will be very helpful in assessing the expansion possible before additional machinery is necessary.

The greatest energy savings are associated with reducing the reboil of CO_2 removal units. This is done using licensed technology which is normally only available to contractors. Once the reboil has been reduced then ways must be found of making the best use of the energy saved. This requires a very careful analysis likely to be outside the resources of most operators. Some energy reduction techniques are more suitable than others for modernisation projects. MEA is the easiest to lower its energy requirement by changing to the Union Carbide AMINE GUARD system. However in spite of the very big energy reduction the consumption is still greater than all the hot carbonate processes. Vetrocoke has a particularly good technique for energy reduction with or without expansion. This involves the addition of another regenerator operated at about 0.8 bar lower pressure than the existing regenerator. This will produce a reduction in reboil of about 40% by using flash steam produced as some of the higher pressure liquid is transferred to the lower pressure regenerator. The extra columns and two new pumps are very easily installed alongside the operating units. The crossover connections can generally be made very easily. Many French units have been modernised using this technology.

One area not to be overlooked is that of machine efficiencies. Many plants from the early seventies had steam turbines with low efficiencies. With prolonged operation these have got worse. However, if steam production is around 200t/hr for a 1000 t/d unit a saving of 10% represents about 0.35 Gcal/t of ammonia. In some cases which we have examined, greater improvements were possible. Now at world prices today 0.35 Gcal represents about £1.2 million. This will pay for a new turbine which should also reduce maintenance charges. This sort of change can be done in conjunction with a radical redesign of the steam and power system, particularly after a CO_2 unit modernisation when much less LP steam may be needed. It is often a good thing at this time to replace small turbines with electric motors. In several countries, like France, electricity is now much cheaper than feedstock. Modernisation is not just about lower energy consumption or increasing capacity, it is about reducing costs. To replace expensive oil with cheaper electricity will make sense in most situations where the ratio lies that way.

A Larger Expansion

We wish to spend the remainder of the technical part of this paper considering an H & G development which is ideally suited to increasing the capacity by 15-40% and reducing the energy consumption up to 12% on most plants except those of CF Braun Design. This is the improved version of our BYAS process. In the original BYAS scheme, one of the processing stages turned out to be expensive. While considering this, a very simple solution was found which both reduced the capital cost dramatically and increased the energy saving even more.

A natural gas based plant subject to a BYAS revamp is shown in the two figures. The major objective is to be able to expand capacity without having to make more than minor changes to the Primary Reformer and its convection section, since major changes to this area are costly and generally require a very long period with the plant shut down. This problem is resolved by transferring the extra reforming duty to the Secondary Reformer. This is achieved by increasing the process air to the Secondary Reformer ahead of the feedstock increase. This results in a gas containing greater than stoichiometric nitrogen. In order not to disturb the present [illegible] conditions of the syngas compressor the excess nitrogen is removed before the gas enters the compressor. The [illegible] is done by passing some gas either from before [illegible]

rejected and the hydrogen with or withou
mixed into the remainder of the gas strea
chiometric mixture. The ammonia loop ca
a variety of ways. A typical scheme will
in more detail. The example will give a ca
35%. For a smaller increase some of the ex
not be necessary. Not all plants can be mo
this way.

All the natural gas feedstock new and
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being desulphurised. The purified gas is th
tially saturated with steam in a hot water sat
enables some of the extra reaction heat u
also consumes the process condensate at t
wet gas is heated and then split into two str
stream is added more steam to bring the S
This is then processed normally in the P
The smaller stream of wet gas is then m
mary Reformer outlet gas stream just bef
Reformer, no extra steam being added.
reforming reaction is completed using a
process air. For a 35% expansion this requ
process air compressor about 75% of the
machine. Some modifications are needed t
the Secondary Reformer and its boiler w
with the extra flow in most situations.

The CO shift system will be too small an
ity is added in parallel. It is the reaction hea
llel units which is used in the saturator ci
CO_2 is not required then about 15% of th
is sent directly to the PSA unit. The other
CO_2 removal unit which may need debottl
12%, which should be possible by chang
At the same time the CO_2 removal unit sh
into a low energy version using the licens
technique.

The PSA unit not only handles some of
but also the washed purge gas from the lo
an example of a new unit which combines t
It removes CO_2 from at least 15% of the s
limiting the expansion needed by the CO
removes excess nitrogen and it recovers t
the loop purge. The syngas which now
metric mixture of hydrogen and nitrogen
of inerts as previously, is compressed in
existing compressor and a new one with
a 35% expansion the make up gas will be
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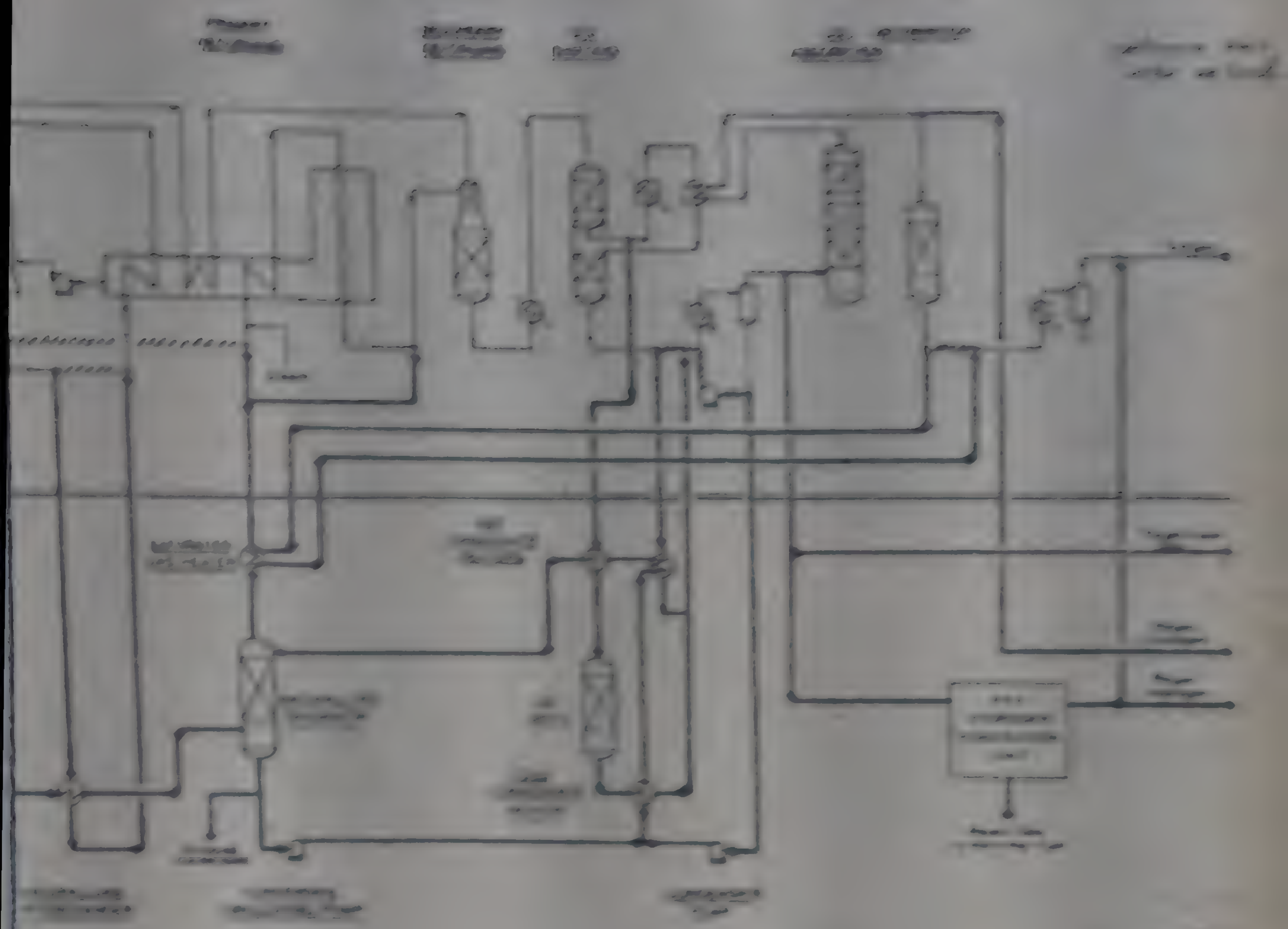
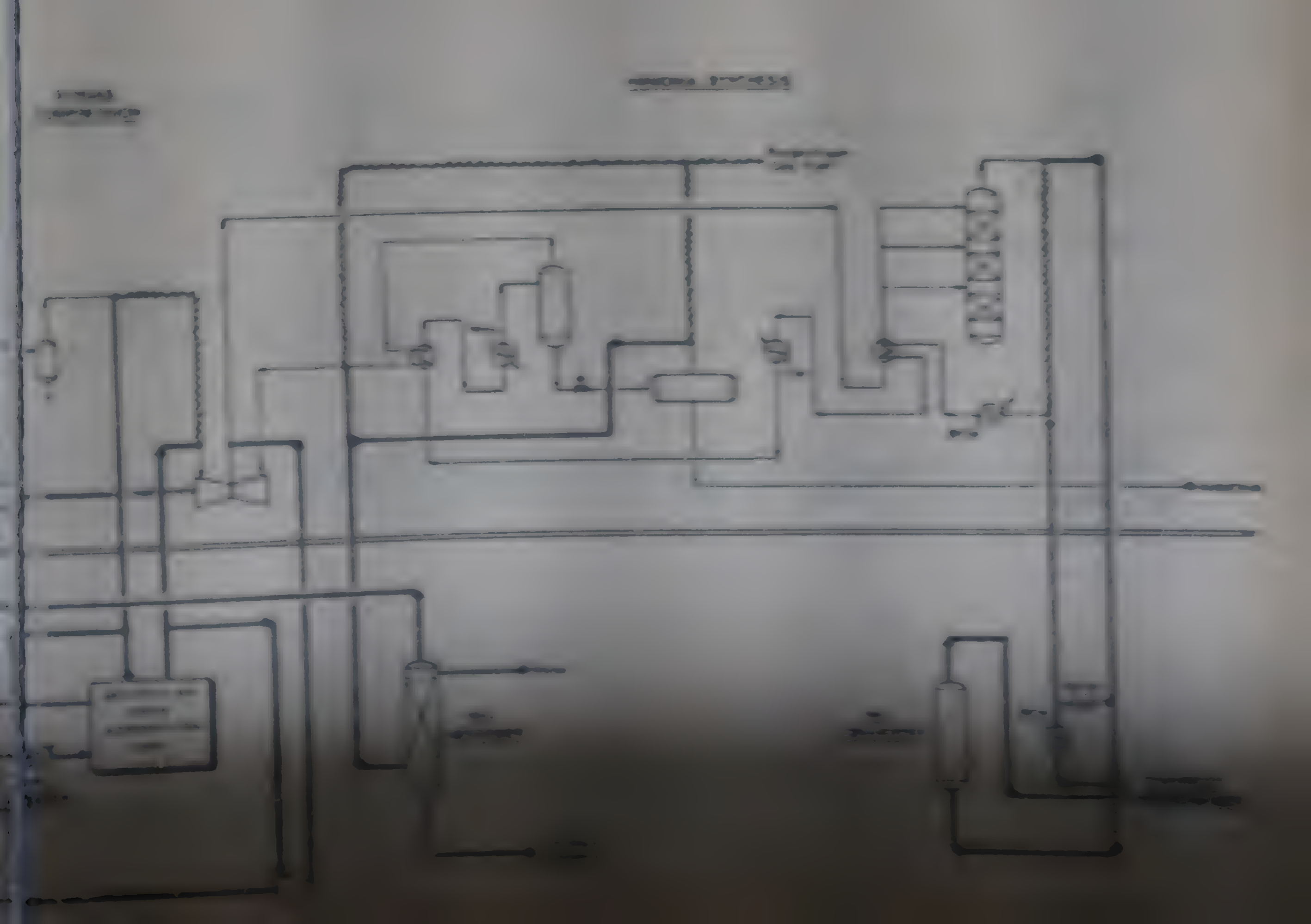
H & G Engineering were very [illegible]





radial arrangement which when filed with small sized catalyst can be 40% more effective than the original design. In other circumstances where this is not possible or a greater expansion is required a second converter may be added in series with the existing reactor.

The gas enters this single bed reactor at about 370°C and leaves at 420-440°C. This increases the conversion per pass by up to 50 per cent for the same circulation rate. New heat recovery facilities are necessary and the water cooled exchanger may need supplementing. However, the refrigeration system has no increase in load thus saving a great deal of energy.

In a few cases like the Luzhou ammonia plant being revamped by H & G at the present time the only practical solution was to install a completely new loop operating at 125 bar. In this case the very high presure, 500 bar, original loop could not be economically expanded. However, most loops below 300 bar do not need such radical solutions to achieve good improvements in performance.

In most cases the new machines will be driven by ele motors but in some situations steam turbines are more able. The extent of modification will depend upon the audit but all the work should be arranged to give the a life extension of 15-20 years. The energy saving wi of the order of 10-15%. The BYAS process has been gra patent protection and is available now only from H Engineering.

SUMMARY

A modernisation project must be subject to a carefully grammed period of investigation before making expe commitments. This work is likely to require the inv ment of a design organisation due to the integrated of modern flowsheets. Schemes like BYAS are attra options to modernise older ammonia plants giving cons ably increased capacity, life extension and lower en requirements.

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News from Abroad

POLLUTION:
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ANDS PVC

ed Solvay has entered the Brazilian PVC market by purchasing Brasivil Resinas Vincilas Industrias Quimicas Electro Chloro Solvay's Brazilian subsidiary is to have paid $100 million for Brazivil, which operates a 90,000 MT/year plant at Sao Paulo.

The deal brings Electro Chloro's total PVC nameplate capacity to 245,000 MT/year but lack of monomer prevents that figure from being reached. The monomer shortage should be overcome once the Sao Paulo cracker Petroquimica Uniao completes its debottlenecking early next year.

MOBAY TO SET UP ANILINE UNIT

Mobay, a unit of Bayer USA is going ahead with plans for a 250 million lb/year aniline plant at its Bay-Town Texas site in collaboration with First Chemical, which currently supplies Mobay with merchant product.

The engineering work for the project is scheduled to be completed in 1992. The plant will employ First Chemical's own process know-how using hydrogen reduction of nitrobenzene. First Chemical will market any aniline not consumed by Mobay.

The aniline plant is designed as a partner to a 132 million lb/year methylene diphenyl diisocyanate (MDI) unit planned by Mobay. MDI is the major derivative user of aniline, taking two-thirds of production.

In the US the aniline market has turned from a position of chronic overcapacity of the 1980's to one increasingly tight supply.

First Chemical will also expand its own aniline unit at Pascagoula MS by about 50 million lb/year to 300 million lb/year, beginning next January.

Aniline use in MDI will continue to be the driving force in the US market. MDI use is expected to climb by 7-8% per year in the early 1990's. As a consequence of tight supply, aniline prices have risen as high as 56-57 cents/lb this year, about double the level in 1983.

The Mobay aniline unit will be the only major US plant for sometime, satisfying domestic demand until at least 1993. Both Aristech and Rubicon, a joint venture of ICI Americas and Uniroyal are rumoured to be considering new capacity.

SCM TO EXPAND TiO_2 CAPACITY

SCM Chemicals a subsidiary of the UK's Hanson group will spend $67.5 million to double TiO_2 capacity at Ashtabula, OH.

The projects involving construction of a second chlorine route production line at the Ashatabula unit will increase capacity by 58,500 MT/year to 107,000 MT/year. Minor changes will be made to integrate the two lines and start-up is expected by early 1991.

There is a continued demand surge in TiO_2 markets. The market is forecast to remain tight in the 1990's, with a worldwide shortfall of approximately 100,000 MT/year forecast by 1993.

Growth in TiO_2 is directed by the paint industry, which takes about half of the pigments production. Its use as a pigment in plastics is rising rapidly accounting for 20% of US output last year.

Du Pont, the world's largest TiO_2 producer is increasing capacity in Mexico to 79,000 MT/year and is considering building a 60,000 MT/year unit at Uberalay, Brazil and a 100,000 MT/year plant in a joint venture in New Zealand.

News from America

COURTAULDS TO DELINK TEXTILE BUSINESS

After separating the chemical and textiles businesses internally in 1985, Courtaulds now proposes to "de-emerge" textiles into Courtaulds Textiles, which will be an independent, publicly traded company. Courtaulds will then comprise the chemical divisions, including foams fibres, chemical intermediates, coatings and packaging materials.

The split subject to shareholder and government approvals is expected to take effect early next year. This move crowns a period of acquisitions and divestitures that extended the company in two different directions. A significant acquisition is that of the purchase of specialty chemicals maker PRC (Glendale, CA) last July. PRC produces high performance coatings, adhesives and sealants.

Of Courtauld's sales of $4 billion in 1988, chemicals accounted for about $2.75 billion, with fibres at 17%, coatings 20%, chemicals and materials 11%, film and packagings 14%. Now the chemical company could stand on its own feet. Textiles too are expected to benefit from the split. Large textiles customers like Marks and Spencer, could be expected to factor Courtaulds on their long-term plans. But according to analysts the company could run into difficulties trying to divide debt between the two segments.

A textile analyst sees the de-merger as "a classic break-up situation, only Courtaulds has broken itself up". Unfortunately in the process Courtaulds have made themselves a very medium size chemical company in a very big world he adds. But the reaction from company managers to the de-merger "has been overwhelmingly positive". Both the divisions now clearly know what each one is.

BUSH'S PESTICIDE PLAN KINDLES DEBATE

US President Bush's plans to bring in changes in US laws governing pesticides would pull high-risk pesticides off the market faster while safety questions are resolved, create a uniform "negligible risk" standard for chemical residues on foods — unlike current laws whereby processed foods are subject to a more stringent pesticide risk standard than raw foods; and reduce the time required to permanently ban dangerous pesticides.

The whole exercise has got a mixed reaction from industry and environment groups. The Natural Resources Defence Council welcomes the plan to speed up the cancellation process but denounces other parts of the proposal for containing "major retreats" in protecting food from pesticides. It feared that pesticides such as Alar could remain in the market if the Environment Protection Agency decided that benefits exceeded risk.

The National Agricultural Chemical Association generally approves the Bush proposal, but feels the government should explain better the risk-benefit components of the regulatory process.

The plan developed jointly with the EPA and the Departments of Agriculture and Human Services, would expand tracking of pesticide sales, distribution and use, provide for periodic safety review of all pesticides and provide incentives for pollution prevention and less risky alternative chemicals.

SHELL DOUBLES UP IN FINE CHEMICALS

Shell International (London) is aiming to double its $250 million/year fine chemicals business by the 1990s with half the planned growth coming from acquisitions. The investment focus will continue to be primarily in Europe,
accounting for 65% of its f
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emphasis will also be place
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... has a 21% share ...ity making it the ...cer. The pigment ...1.5 billion or 5% ...lies, and makes a ...o profits. Du Pont ...e its share of TiO_2 ...995, mainly at the ...roducers.

...each 3 million ... an increase of ...% above the 1988 figure. By 1993 TiO_2 supply will increase to 3.4 million MT/year, an average growth of 4.2% per year, slightly ahead of growth in demand. The extra availability of material should bring operating rates from the full capacity utilisation of the past two years to about 98% for 1989. Rates will later fall to 95%-96% in 1990 or further, if there is a recession in one of the major industrialised countries.

Du Pont's own capacity increase programme has included a $15 million modernisation of its Altamira, Mexico plant. A $22-million project has also been started at Altamira to increase capacity from 55,000 MT/year to 79,000 MT/year. That project is expected to be completed by the end of 1990.

Du Pont's $100 million second line expansion at De Lisle, MS, expanded capacity to add 90,000 MT/year by 1991, bringing the total at the site to 270,000 MT/year. The company's third planned offshore plant is for Brazil, near Uberaba in Minas Gerais state. Plans call for a 60,000 MT/year plant to be on stream by 1995.

Those projects together with further debottlenecking could lift Du Pont's capacity to 1 million MT/year by the mid 1990s. This could require a 50% increase in supply of titanium bearing ores. Du Pont is the world's largest user of titanium bearing ore.

The company owns a mine at Florida, supplying about 20% of needs; it buys the rest from worldwide sources. Du Pont has signed an agreement with the Republic of Senegal for exploration and possible mining of ilmenite, a medium-grade titanium bearing ore. Ilmenite from Senegal will be used at Du Pont's four TiO_2 plants in the US and one in Mexico. Also, a technical agreement has been signed with Brazil's largest mining company, Companhia Vale do Rio Doce, to develop low-grade anatase ore deposits in excess of 1 billion MT — enough to supply the world titanium industry for 100 years.

In the future Du Pont believes environmental costs faced by sulphate-route TiO_2 producers will give chloride producers a commercial edge. Du Pont is still working to develop a no-waste process. Du Pont estimates that the necessary addition of acid waste recycling to a sulphate-route plant to meet environmental regulations would make the process about 20% more costly than chloride route production.

Du Pont is currently the only company with a direct chloride route to TiO_2 from medium grade ilmenite, the ore commonly used in sulphate route processes. Other chloride routes need ilmenite to be upgraded via a beneficiation process to synthetic rutile.

Later on Du Pont may elect to enter into a joint venture production unit with an existing European producer, or it may purchase a sulphate route capacity. Before that, however, the company may develop a position in the Soviet Union, India or China.

...gional demand (in thousands of MT/year)

	1988	1993	Average annual growth(%) (1988-1993)
	520	660	4.9
	1,070	1,2[illegible]	2.5
	165	200	3.9
	1,055	3,2[illegible]	3.0

HIMMONT, STATOIL DETAIL PP PLANS

Himmont (Wilmington, De.) and Statoil (Oslo) have re-affirmed their plans to build a grass-roots polypropylene plant in Antwerp. They are also to build a propane dehydrogenation unit to supply feedstock to the polypropylene unit.

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will double the company's
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being considered by the
group is a world-scale
The plant will be based on
the North Sea.

News from Japan

DING PLANNED SECTOR UP 17%

International Trade ITI) has made a ey of plant-and- ent planned by 1,614 al 1989 and submit- its survey to the Indu- ittee attached to the e Council.

According to MITI's survey, the planned plant-and-equipment investment amounts to ¥17,501.1 billion on a construction basis, up 15.0% over the preceeding year's level, showing a double-digit growth rate for the second year in a row (up 18.9% for fiscal 1988).

Plant-and-equipment investment planned by manufacturing industries attains an increase rate of as high as 27.2% (up 27.3% for preceding year).

nd-equipment investment planned for FY 1989

	Total	First half	Second half
	1,751	889	862
	3,569	1,484	2,085
drugs*)	10,378	5,117	5,261
	4,748	1,997	2,751
	3,435	1,683	1,752
	6,871	3,420	3,451
s	2,482	1,264	1,217
ry	4,604	1,997	2,607
nery	13,460	6,594	6,866
ery	5,230	2,485	2,745
	16,117	7,970	8,147
ring	8,675	4,373	4,303
	506	252	254
	1,868	852	1,016
	37,360	18,351	19,009
	3,249	1,411	1,838
*	19,845	11,242	8,603
	7,385	3,531	3,854
	5,225	2,441	2,784
	44,454	21,009	23,446
s	2,566	1,254	1,312
	175,011	84,257	90,754
ndustries	79,488	38,447	41,041
	31,515	15,085	16,430
mbly	47,973	23,362	24,611
ng	95,523	45,810	49,713
ng electric	58,163	27,459	30,704

figures are not included in the figures given below. [illegible]

The chemical industry excluding the drug sector plans to invest a total of ¥854.6 billion (up 17.7%) in production facilities; the corresponding figure for the preceding year was ¥730.1 billion, up 29.4%.

The committee has put forward proposals aimed at eliminating legal limitations on corporate-bond flotation and maintaining the loan-on-security principle.

MITI INTENT ON PROTECTING INTELLECTUAL PROPERTY

In an attempt to protect intellectual property, MITI recently established its Committee, on information regarded as property following formation of its Enforcement Committee. The new committee has started to examine how the secrets of private enterprises may be safeguarded.

In a related development, the ministry plans to shortly set up three other committees aimed at studying protection of trade marks, patents on biotechnology products and relationships between intellectual property and government policies for encouraging business competition. It also plans to establish five more committees handling problems related to intellectual property.

All these committees already established or planned will team up with Institute of Intellectual Property to seek ways to completely protect intellectual property. The institute was inaugurated last June with the cooperation of the government (MITI) and industry.

The abovementioned Enforcement Committee recently compiled an interim report on the protection of intellectual property. The report calls for imposing restrictions on import of products – which have infringed rights related to intellectual property -, defining the rights as patents, utility model patents, design rights, trade-mark rights, copyrights, "neighbouring" rights and rights for utilizing ICs, and establishing a new system ensuring that the said restrictions on imports of illegal products will be imposed when claims are made by those having the abovementioned rights.

DAIICHI WILL CONDUCT CLINICAL TESTS ON ITS NEW DRUGS IN U.S.

Daiichi Pharmaceutical Co., will launch clinical testing in the States of drugs it has developed in house: they will include such items as "DR3355" bactericidal agent and "DP1904" thromboxane synthase inhibiting agent to begin with. To this end, the company has expanded the size of its liaison office in New Jersey and will increase the number of personnel. The two abovementioned drugs are now undergoing phase-II clinical tests in Japan.

The company set up in 1982 a wholly owned subsidiary, Daiichi Pharmaceutical Corp.(DPC), in New Jersey for sales of bulk vitamin agents and licensing business for the parent firm in the States. DPC has licensed Daiichi's "Tarivid" antibacterial agent to Johnson & Johnson (J&J) of the U.S. J&J applied for its manufacturing approval to the FDA in December 1987 and the approval is likely to granted by the end of next year. The Japanese firm says that DP1904 and DR3355 have market potential in the States.

AGROCHEMICAL EXPORTS TO EUROPE, AFRICA UP

Japan's Ministry of Agriculture, Forestry and Fisheries recently issued a report on agrochemical exports in the 1988 pesticide year. According to the export, exports were valued at ¥59,436 million, an 11.8% rise over the previous year, and imports, ¥48,386 million, an 8.8% drop.

Regarding exports to company, Sumitomo Chemical Co. still ranked first, followed by Nippon Soda Co., Ishihara Sangyo Kaisha, Ltd. and Nissan Chemical Industries, Ltd. All of these companies are manufacturing paddy-field herbicides.

Agrochemical exports had been declining after hitting a peak of ¥ 942,000 million in the 1984 pesticide year. However, in the 1987 and 1988 pesticide years, they showed increases, generating a recovery feeling. Since the range of fluctuation concerned is great, stemming from the foreign-currency situation in China and other developing countries, exports every year cannot be used as the yardstick of domestic manufacturers' international competitiveness.

From 1987, when the yen's upsurge against the dollar took firm root, exports have been on an upward trend. Furthermore, increases in exports to North America and Europe have been led by manufacturers placing emphasis on paddy-field herbicides in overseas countries, showing the fruit of their efforts to branch out into overseas countries.

On the other hand, exports of insecticides such as Sumithion to cope with outbreaks of locusts in northern Africa have begun to increase. However, this will be revealed in statistics to be issued the 1989 pesticide year. The trend over the last several years has been that imports have remained almost unchanged. The order of the five major import sources, viz., the United States, West Germany, Switzerland, France and the United Kingdom, remained the same, and imports from these five countries held a 90% share of the total.

ADEKA ARGUS TO MERGE WITH ASAHI DENKA

Asahi Denka Kogyo K.K. recently announced that it will absorb on October 1 next year its wholly owned subsidiary, Adeka Argus Chemical Co. The two firms will submit the merger plan concerned to their general meetings of stockholders both slated for next June

The expanded company
annual sales of more than ¥
The planned merger is aim
ing up their marketing activ
work, international oper
financial structure by push
efficient use of corporate re
streamlining office work.

Asahi Denka feels that it
to merge with the subsidiar
can establish many more
bases both at home and o
diversify into new business
company expects the merger
the efficiency of business
through elimination of ove
the two companies' busine

Adeka Argus, for its ow
siders that the corporate
help itself to develop nev
thrust deeply into overseas
beef up its financial struct

Asahi Denka and Adeka
cast that their turnovers for
will amount to approximat
¥20 billion, respectively. Th
established in 1962 as a 50:5
ture between Asahi Denka
Chemical (U.S.) and has
all-round additive maker ha
stabilizers, plasticizers
absorbing agents. It came t
owned by Asahi Denka in F
year.

'88 PLASTIC-PRODUCT
DUCTION IN ROK TO
LION T. FOR FIRST TI

The Japan Plastic Industry
recently issued a report on
production of plastic produ
and Taiwan's imports of
plastics. According to the
production of plastic pro
film, pipe, vessels, and
material has been on the
after year. In 1988 it
2,085,000-ton level for the
Korea [illegible]

ctured in the first
year, so it has
will show a rise
e previous year.

eering plastics in
ing a high growth
ame concerned is
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lyamide, polyac-
PET and PBT
900 tons, a 31%
revious year and
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tion of the main
factured in Korea,
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rease and produc-
00 tons last year,
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Pipe production
ns, a 13 per cent

ril period of this
f pipe were man-
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has been showing
r the last two or
90,200 tons a last
e. In the January-
ar production reg-
essels production
last year, a 15.6
uary-April period
at 57,000 tons
production last year scored 32,900 tons, a 16.2 per cent rise, and for the January-April period of this year, 12,500 tons.

JAPAN'S CRUDE OIL IMPORTS UP 11.6% IN SEPTEMBER

Japan's crude oil imports in September rose 1.6% from a year earlier to 15.67 million kl, according to government preliminary data released. An official at the Ministry of International Trade and Ministry (MITI) attributed the rise to favorable industrial demand for crude oil, expecially in the transport sector.

The official also noted that crude oil imports from the Middle East, Southeast Asia and China increased sharply during the month. Imports from Southeast Asia, including Indonesia and Malaysia, rose a hefty 43.3%, compared with a 17.1% rise from the Middle East and a 14.7% increase from China. Of the total imports of crude oil in September, 77.9% came from the 13-nation Organization of Petroleum Exporting Countries (OPEC), in which the United Arab Emirates, Indonesia and Saudi Arabia stood as the top three oil exporters to Japan.

Imports of fuel oil jumped 31.4% to 4.13 million kl, of which diesel oil accounted for 548,000 kl and kerosene 573,000 kl. Production of fuel oil, such as gasoline, naphtha and aviation fuel totaled 12.73 million kl, up 8.1% from a year before. Domestic sales of fuel oil, mean-while, came to 15.84 million kl up 8.4%. In line with increased consumer purchases of luxury cars in the past several months, consumption of fuel oil is steadily on the rise, the official said.

MAGNESIUM SILICATE TO BE IMPORTED FROM U.K.

Nippon Silica Industrial Co. has set itself to importing "Laponite" magnesium silicate from Laporte Industries Ltd (U.K.) for domestic sales. The two firms concluded a trade contract last June and the former has been supplying the product to domestic users in sample form. It plans to manufacture the product by itself two years hence after exploiting the domestic market through trial sales of the product. In its middle-term business plan, the company aims at increasing the share of special silica in its combined sales. It intends to double sales by building up special-silica operations.

UBE TO CONSTRUCT NEW POLYIMIDE FILM PLANT

Ube Industries, Ltd. has decided to expand its production capacity for polyimide film (brand name: Upilex), demand for which has been increasing centered on the electronics-related field. Specifically, it will build an S-type exclusive-use plant with a capacity of 150 t/y by investing a total of ¥3 billion. As a result, the firm's production capacity will reach 230 t/y, almost triple the present capacity. The company will start constructing the plant at its Ube Chemical factory with completion scheduled for July 1990.

At present it has an 80-t/y polyimide-film plant. In addition to that of the electronics field, demand for polyimide film has recently expanded to special electric wires and high heat-resistance structural materials such as those for airplanes. Consequently, the company has decided to construct the new factory. Simultaneously, it will [illegible]

wan's imports of engineering plastics
(in tons)

1985	1986	1987	1988
5,354	9,393	16,658	23,459
4,932	7,852	9,893	11,819
3,381	5,494	6,928	8,522
735	1,824	3,123	4,360
6,134	1,091	649	772
20,536	25,654	37,251	48,932

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film.

NIPPON MINING INTENT O
PRODUCING FCC CATALYS

Nippon Mining Co. is plann
manufacture on its own catlysts for
catalystic crackers (FCC).

The company is already engag
sales of hydrogenation-desulfuriz
catlysts produced by its wholly o
subsidiary, Oriental Catalyst Co
has now decided to produce FCC
alysts on a full scale in view of the
prospects concerned. The said pro
are based on the fact that deman
gasoline and intermediate fractio
anticipated to grow, whereas Jap
depended on imports for 60-70%
FCC-catalyst needs, and moreover
is only one Japanese maker of suc
alysts. Nippon Mining thus inte
strengthen R&D work for FCC
lysts as well as implement M&A t
aimed at Western companies.

M'BISHI GAS CHEMICAL FORMS JOINT VENTURE I
S.KOREA

Mitsubishi Gas Chemical Co.
has established a joint-venture com
with a South Korea firm in So
manufacture super-high-purity h
gen peroxide used in the product
semiconductors. The new com
called Sam Young Pure Chemical
is capitalized at about ¥500 m
equally shared by Youngpo Che
Co. and Mitsuibishi Gas Chem

Sam Young Pure Chemicals w
headquartered in Seoul, with the
location to be named later, a Mi
official said. Youngpo Chem
been manufacturing chemical p
in South Korea through a
agreement with Mitsubishi Gas C
ical. The new company is expe
have a production capacity of 5,0
per year.

Developments from Japan

IRMS TO
ESIZE THIN

nc. has technically
cts & Chemicals,
gard to synthesis
amond film. They
former's technol-
high-quality thin
the latter's low-
is technology for
mond-like carbon

Japanese company
using ion beam-
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CAN BE
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cases. There is a strong possibility that liver cancer can be diagnosed in the pre-cancer stage. Asahi Chemical wants to file an application for approval next spring for NM-17 and at the earliest hopes to put it on the market next year.

Asahi Chemical induced bladder cancer cells NBT into mice and developed a new cancer marker ATM1-17 as an antigen which is confirmed by human killer T-cells. The monochlonal antibody NM-17 is used to confirm this antigen and a measurement method for ATM1-17 based on the EIA method was established. In cooperation with Dr. F. Takaku of the University of Tokyo Faculty of Medicine, clinical evaluations were carried out. Based on these evaluations, out of 51 liver cancer cases, a positive result was obtained in 38 cases or 73%. For the healthy controls, in all 99 cases a negative result was obtained. Also, 49 cases of cirrhosis of the liver and 29 cases of chronic hepatitis were examined and 21 cases of the cirrhosis of the liver or 42% and 1 chronic hepatitis case showed positive results.

Up until now AFP (alpha feto protein) was used in diagnosis of liver cancer. Both methods achieved almost the same positive ratio and there was determined to be no correlation between the two methods. In particular, with NH-17, a positive result was achieve for all seven cases where it was difficult to make a diagnosis with AFP because the liver cancer was less than 3 cm in diameter. It is extremely important for liver cancer to be diagnosed in the early stages and NM-17 is particularly useful in that regard.

In addition, there have been indications that acute hepatitis, chronic hepatitis and cirrhosis of the liver can deteriorate into liver cancer. With NM-17, 43% of the patients with cirrhosis of the liver tested positive and there is the possibility that at that cirrhosis of the liver stage, it is possible to diagnosis patients which are high risk to develop liver cancer and pre-cancer states. For this reason, Asahi Chemical in cooperation with Prof. Takaku's group will do a follow-up study on the cirrhosis of the liver patients who tested positive and also continue to test the cirrhosis of the liver patients who tested negative and clinically evaluate NM-17 in the progression from cirrhosis of the liver to liver cancer.

NEW TUMOR-KILLING SUBSTANCE FOUND IN ANIMAL BRAIN

A joint research team in Japan has discovered a new tumor-suppressing factor in some animals. This was revealed at the meeting of The Japan Cancer Association held late in October by the research team comprising experts from Hiroshima Prefectural College, Itoham Foods Inc. and Kyowa Hakko Kogyo Co. The substance called NBCF (neonatal brain-derived carcinostatic factor) is a glycoprotein with a molecular weight of about 62,000 occurring in the neonatal brain of an animal and acting to selectively destroy a certain kind of cranial nerve cell.

Animal tests using mice show that this substance is quite effective for curbing growth of cerebral tumor cells without affecting normal cells. In particular, it has proved to have a strong effect against highly differentiated malignant tumour cells. The researchers hope that the substance may be used as a remedy for neuroblastoma that often attacks infants, an effective treatment for which has not been established as yet.

Researchers at Itoham Foods have also succeeded in singling out NBCF from swine brains. As swine have larger brains than mice, the researchers say the use of swine will facilitate research for establishing which site of the brain NBCF comes from. Kyowa Hakko researchers will continue work on the identification of its molecular structure and the genetic mechanism of its synthesis.

NEW L-TRIPTOPHAN PRODUCTION PROCESS USING E. COLI BARED

Mitsubishi Petrochemical Co. has established a production method for L-triptophan using gene-modified E. Coli producing triptophanase — an enzyme acting to promote L-triptophan synthesis — at a high rate. The method is claimed to feature easy cultivation of the modified E. Coli. The company has already developed a triptophan production process by means of gene-modified E. Coli producing triptophan synthase - another enzyme acting to spur L-triptophan synthesis - at a high rate. The company is now constructing a pilot plant for L-triptophan at its Yokkaichi factory to help it reach a final conclusion on the process to be adopted for its commercial-scale L-triptophan plant whose operation start-up is slated for the spring of 1991.

The new method is to obtain triptophan from indol and L-serine in the presence of triptophanase as a catalyst. The triptophanase-producing E. Coli was prepared by using the E.coli K-12 strain as a host and plasmid pBR322 -in which a promoter with a triptophanase-inducing gene and a gene called mini-F were inserted — as a vector. It has been confirmed that the mini-F gene acts to entirely regenerate the plasmid over 100 generations.

Experiments so far conducted show that the modified E. Coli multiplies to 160 grams per liter through cultivation over 15 hours and almost the entire amount of triptophanase present acts to promote L-triptophan synthesis.

BIODEGRADABLE PLASTIC UNVEILED: FERMENTATION RESEARCH INSTITUTE

A Fermentation Research Institute group has reportedly formulated a completely biodegradable plastic. The new material centers on a polymer blended from a mixture of microorganism-produced polyhydroxy butyric acid (PHB) — itself drawing attention as a biodegradable plastic — and polycaprolactone (PCL), a fatty polyester. The team has also developed a technology for freely controlling the plastic based on changes in speed and compounding ratio of biodegradation. Discovery of the PHB/PCL blended polymer is fueling expectations for practical use of a biodegradable plastic that is workable at the processing stage and capable of substantially lowering costs.

The biodegradability aspect of microorganism-produced plastics is well known. Moreover, advances have been made in fostering technologies to control degradation speed and plastic copolymerization through the provision of nutrient sources. The biggest problem impeding full-scale practical applications, however, is how to reduce costs and effect large-lot production to make these materials feasible for industrial use. Although biodegradable plastic bags made from a polyethylene/corn-starch mixture have been commercialized in the U.S., problems such as residue from the non-biodegradable portion of polyethylene still remain to be solved.

The newly formulated PHB/PCL blended polymer boasts a high 175°C melting point derived from PHB, but its overly high crystallization characteristics make film and fiber processing virtually impossible. The cost is also considerably higher than ordinary polymers. On the other hand, the PCL synthetic polymer fat-group polyester possesses biodegradable characteristics but a low melting point of 62°C. Furthermore, its inferior thermal resistance and mechanical strength make it unsuitable for broad-based use. Blending the two, however, results in a biodegradable polymer with mutually improved physical properties. In particular, the PHB/PCL blend allows ease of plastic processing and control over biodegradation speed and physical properties by altering the blend ratio. As such, antic
growing concerning its pract
a new biodegradable plastic

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versity. In the therapy, blood
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mixed reacted with hypertonic
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It was applied to eight canc
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The research concerned
ducted as part of "experimen
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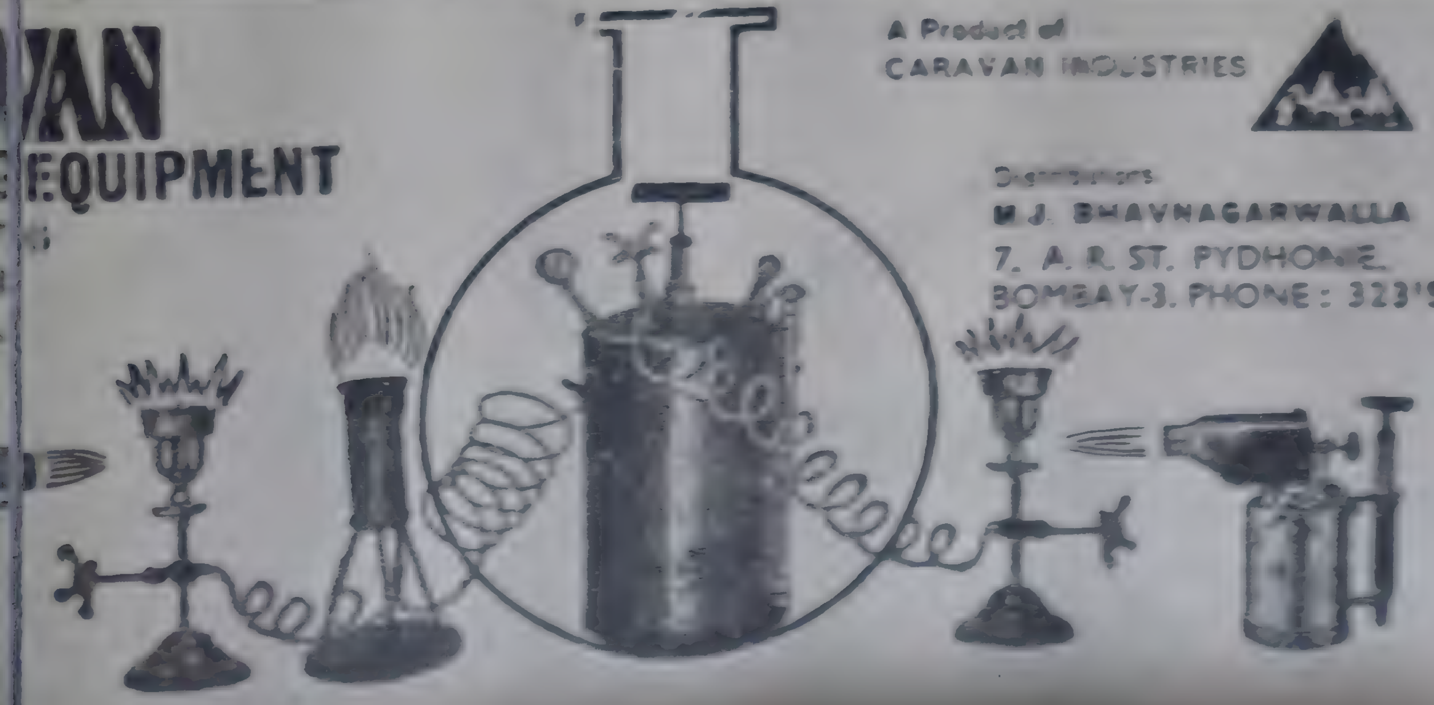

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IARKET INFORMATION

Markets Steady

es of most items in the y chemicals market remained around the previous week's Availability of most items ned generally easy. Ammon- loride and acrylamide moved up marginally by Rs. 2 and Re. 1 respectively. Polyvinyl alcohol eased by Rs. 5 per kg and was available at Rs. 120 per kg. Dye intermediates also ruled steady with better supply of materials.

We cannot guarantee the accuracy of the prices published in CHEMICAL WEEKLY as they are based only on the enquiries made by our correspondent – and, as such they are not FIRM PRICES as between a buyer and seller. The prices are published only with a view to giving some ideas of the market conditions.

The prices are inclusive of Excise and Maharashtra Sales Tax.

(Prices as on December 12, 1989)

TRIAL CHEMICALS	Per Kg.
nium sulphate	2.50
nium phosphate (Mono)	14.50
nium phosphate (Di)	14.00
nium carbonate (Di)	17.00
nium bicarbonate	5.60
nium chloride	5.00
nium nitrate	6.00
c white powder	22.00
mide (Resale)	70.00
carbonate	6.00
ing powder (33% Cl)	4.20
Borax (Granular)	20.00
Borax (Powder)	22.00
Boric acid (Tech)	26.00
Bisphenol-A	70.00
Butyl carbitol	110.00
Caustic soda (Flakes)	13.00
Caustic soda (Solid)	12.00
Caustic soda (Lye)	10.00
Calcium chloride 70% (Solid)	3.25
Calcium chloride 75-80%(fused)	3.50
Calcium chloride 36% (Anhydrous)	5.00
Calcium carbonate (precipitated)	4.25
Calcium carbonate (Activated)	4.75
Cobalt oxide	300.00
Cresylic acid	62.00
Camphor (Indian)	105.00
Cream of Tartar (Tech.) China	70.00
Citric acid (Belgium) (Resale)	47.00
Citric acid (Indian) (Resale)	47.00
Copper sulphate	25.00
Chromic acid	65.00
Ethylene urea	58.00
Ferric chloride (Lumps)	5.50
Ferric chloride (Anhydrous)	16.00
Glue flakes	15.00
Glue sheets	6.75
Gohsenol GH-17	110.00
Hydro	44+ST

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Tel.: 2048692/2041145
Telex: 011-5423 HCL IN
Gram: HIREORG

Agarwal Ad

Hyflosupercel	20.00
Hexamine (Resale)	35.00
Industrial Wax	25.00
Litharge	40.00
Lead Acetate (Tech.)	31.25
Lithopone	20.00
Magnesium chloride (Crystals)	5.00
Menthol crystal (Flakes)	900–Ex–ST
Menthol bold	665–Ex–ST
Menthol crystal cold	700–Ex–ST
Magnesium carbonate (Japan)	16.00
Magnesium carbonate (Indian)	18.00
Maleic Anhydride (Resale)	42.00
Mercury (34.5 Kgs)	10,500.00
Nickel chloride	110.00
Oxalic acid (Resale)	16.00
Peppermint oil (Rectified)	195–Ex–ST
Potassium carbonate (Indian)	34.00
Potassium carbonate (Imported)	33.00
Potassium bichromate	32.50–ST
Potassium phosphate (Mono)	14.00
Potassium phosphate (Di)	14.00
Polyvinyl alcohol (No. 117)	115.00
Polyvinyl alcohol (No. 173)	120.00
Polyvinyl alcohol (No. 208)	150.00
Paraformaldehyde (Resale)	20.00
Phthalic anhydride 30% (Resale)	24.25
Pentaerythritol (Resale)	45.00
Paraffin wax	13–ST
Rongalite (German)	82–ST
Rongalite (Czech.)	75–ST
Sodium sulphate (Fine)	6.00
Sodium sulphate (Coarse)	5.00
Sodium sulphide 50-52% (Flakes)	11–ST
Sodium sulphide 58-60% (Flakes) (TCL)	20.00
Sodium sulphide pure (Flakes)	12.25
Sodium nitrite (Resale) per 50 kg.	730.00
Sodium chlorate 80% (Spain)	65.00
Soda Ash (Tata)	4.80
Soda Ash (Birla)	4.50
Soda Ash (Imp.)	4.50
Sodium bicarbonate	7.50
Sodium bisulphite	4.50
Sodium silicate	3.00
Sodium acetate	5.00
Sodium alginate	300–ST
Titanium Dioxide (Anatase)	85–ST
Titanium Dioxide (Rutile – RCR$_2$)	112–ST
Tartaric acid	100.00
Trisodium phosphate	5.50
Thiourea	90.00
Urea (Tech.)	2.90
Vacuum salt	1.00
Zinc Dust	32.00
Zinc Oxide	58.00
Zinc chloride powder (Tech.)	12.50
Zinc sulphate	7.00

SOLVENTS	Per Kg.
Acetic Acid Glacial (Resale)	14.00
Acetic Anhydride (Resale)	36.00
Acetone (Resale)	22.00
Adipic Acid	70.00
Aceto Acetanilide	55.00
Aniline Oil	51.00
Benzoate Plasticiser	62.00
Butyl acrylate	89–ST
Butyl stearate	45.00
Butanol	
Benzyl Alcohol	
Benzyl Chloride	
Benzo trichloride	
Benzoyl chloride	
Bromine Liquid	
Chloroform	
Carbon Tetrachloride	
Cellosolve	
Cyclohexanone	
Cyclohexanol	
Diacetone (Resale)	
Diethyl Oxalate	
Diethyl glycol (DEG)	
Dioctyl Phthalate	
Diethyl Phthalate	
Dimethyl Phthalate	
Dioctyl Adipate	
Dibutyl Adipate	
Dipentene	
Dimethylamine 40%	
Dimethylamine 50%	
Ethyl Acetate	
Ethyl Acrylate	
Ethylene Dichloride	
Ethylene Glycol	
Formic Acid (Imp.)	
Formaldehyde (Resale)	
Glycerine (CP)	
Glycerine (IW)	
Hydrogen Peroxide 50% (Re	
Isopropyl Alcohol	
Isobutyl Alcohol (Resale)	
Monoethanolamine (Resale	
Melamine	
Methyl Ethyl Ketone	
Methyl Isobutyl Ketone	
Methyl Acrylate	
Methylene Dichloride (Resale	

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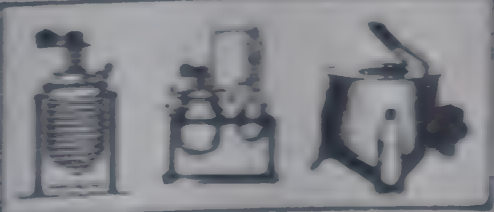

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Ortho Cresol	30+ST
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Polyethylene Glycol (No. 200)	38.00
Polyethylene Glycol (No. 400)	68.00
Polyethylene Glycol (No. 600)	52.00
Polyethylene Glycol (No. 1500)	54.00
Polyethylene Glycol (No. 4000)	72.00
Polyethylene Glycol (No. 6000)	85.00
Para Cresol	110.00
Styrene Monomer	37+ST
Sorbitol	14.00
Sulphuric Acid	2.80
Trichloroethylene	29.00
Triethanolamine (Resale)	71.00
pentine Oil (Germany)	8.00
rkey Red Oil (50%)	20.00
l Acetate Monomer	47.50

SOLVENTS	Per Litre
Benzene	10.80
N-Heptane	10.50
N-Hexane	13.00
Methanol	9.50
Solvent Naphtha Heavy	10.50
Solvent Naphtha Light	8.50
Toluene	13.50
Xylene	16.00

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Alphanaphthylamine	63.00
Alpha Naphthol (Imp.)	185.00
Aceto Acetic Ester (Methyl)	84.00
Ammonium Molybdate	210.00
Anthraquinone	115.00
Anthranilic Acid	77.00
2-Amino 4-Nitrophenol	140.00
Blue B. Base (Local)	265.00
Beta Naphthol (Atul)	72.00
Benzidine Dihydrochloride (BDH)	96.00
Bromamine Acid	600.00
BON Acid	130+Ex+Ta
Chicago Acid (Atul)	345.00
Coach Acid	55.00
C. Acid (Imp.)	210.00
Cyanuric Chloride	128.00
2,4- DNCB	30.00
Dihydrothio PTOS (Imp.)	1,000.00
Dimethyl Aniline	70.00
Diethyl Aniline	155.00
Diamino stilbene disulphonic acid	165.00
3,3-DCB (Imp.)	180.00
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H. Acid (Atul)	120.00
G. Salt	75.00
Isophthalic Acid	45.00
J. Acid	355.00
J. Acid Urea	425.00
K. Acid	125.00
MPDS (German)	185.00

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Para Anisidine (PA local)
PNA
Para Cresidine (Imp.)
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PNCB
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Bombay Dyes Market

(Prices as on December 12, 1989)

ACID COLOURS	Per Kg.
Acid Violet 4BS	*190.00
Acid Maroon V	110.00
Acid Orange II	112.55
Acid Orange IIY	93.85
Acid Red A	137.00
Acid Scarlet 3R	126.35
Acid Red 3BN	*195.00
Acid Red R2R	132.00
Acid Red RS	88.00
Acid Patent Blue AS	*290.00
Acid Green V	*375.00
Acid Coomassie Blue	200.00
Acid Yellow 5GN	65.00
Acid Red PG	85.00
Acid Red GRS	79.00
Acid Black 10 BX	157.15
Acid Black BX	126.95
Acid Black Wax	135.50
Crocein Scarlet MOO	200.30
Procinyl Yellow GS (ICI, UK)	265.00
Procinyl Red GS (ICI, UK)	530.00
Procinyl Blue RS (ICI, UK)	315.00
Procinyl Scarlet G (ICI, UK)	600.00
Procinyl Orange G (ICI, UK)	250.00
Procinyl Rubine (ICI, UK)	550.00

* To get resale price add 5% tax

DIRECT COLOURS	Per Kg.
Yellow 3GX	114.80
Sun Yellow RCH	175.85
Fast Yellow GCH	171.50
Yellow CFG Hly. Conc.	721.00
Fast Yellow GS	125.95
Fast Yellow CHRS	116.85
[illegible] Orange A	216.35
Fast Orange GR	171.50
Red	122.65
Dark Tan	98.15
Red IR	98.15
Red 4B	217.55
Bordeaux BW	170.10
Fast Scarlet 4BS	203.50
Red 12B	220.45
Bordeaux Hly. Conc.	243.20
Cotton Red N	117.25
Brill. Fast Helio B	352.85
Brill. Fast Helio 2R	385.85
Brill. Fast Helio 3RS	177.30
Brill. Fast Helio BS	116.10
Brill. Violet Extra	191.45
Blue 2B	102.50
Blue G	230.45
Sky Blue FB	242.00
Copper Blue GR	190.25
Fast Greenish Blue GL	114.60
Developed Black BT	149.95
Blue NB-2B	348.45
Blue NB-2BG	214.70
Developed Black NB-GHB	214.70
Green B	142.75
Green NB-B	218.90
Green 2B-N	216.90
Brown MR	197.40
Brown CN	137.00
Golden Brown G	175.85
Catechin G	155.70
Omega Tan	161.45
Catechin GS	102.80
Black E Hly. Conc.	180.15
Black E Extra Hly. Conc.	180.15
Black NB-ER Hly. Conc.	290.50
Red 2B	
Red FB	
Red Violet FBL	
Orange 3R	
Violet 3R	
Violet RL	
Violet 6R	
Scarlet RR	
Rubine 3B	
Rubine CB	
Blue GL	
Blue BGF	
Navy Blue RE	
Brown 3REL	
Black GEL	
Dark Brown 3B	

DISPERSOL COLOURS	Per Kg.
Red B 3B Conc	611.50
Red B 2B Conc	797.90
Red C6 Powder	1048.25
Red D2B Powder	589.85
Violet C 4R Conc.	1202.70
Blue BG Conc	580.65
Blue BN Powder	128.20
Blue D 2R Powder	588.25
Navy BT Conc	531.95
Blue B 2G Conc	577.95
Black BT Conc	319.50
Blue BR	462.40
Yellow TGL	613.20
Yellow 5RX	269.90
Yellow 3G	473.20
Yellow	140.00
Yellow AL	167.20
Yellow Brown REL	311.75
Yellow FFL	571.40
Gold Yellow GG	320.80
Pink REL	583.00
Red REL	615.60

BASE COLOURS	
Fast Yellow GC	
Fast Orange GC	
Fast Scarlet R	
Fast Scarlet RC	
Fast Scarlet RCR	
Fast Scarlet G	
Fast Scarlet GN	
Fast Scarlet GG	
Fast Scarlet GGS	
Fast Red B	
Fast Red RC	
Fast Red R Flakes	
Fast Red TR	
Fast Red TR Oil	
Fast Red RL	
Fast Red KB Oil	
Fast Bordeaux GP	
Fast Garnet GBC	
Fast Violet B	
Fast Blue BB	

NAPHTHOL COLOURS	
ASG	
AS	
ASSW	
ASBS	
ASBO	
ASD	
ASOL	

369.00
336.05
236.00
249.95
2002.35
2459.45
143.00
538.65
652.60

Per Kg.

207.95
145.65
168.55
214.75
276.05
332.30
275.45
387.65
201.15
366.10
244.70
303.80
157.95
313.15
213.55
245.05
179.80
243.45
182.00
160.05
218.35
137.10
163.65
219.55
175.40
333.75
436.40
207.95
286.20
213.65
358.15
265.75
595.30
181.50

Blue H FRD	305.80
Navy Blue H3R	333.75
Blue H 5RX	286.20
Navy Blue M3R	386.70
Brill. Blue MR	405.60
Brill. Blue M RX	214.20
Brill. Blue M-G	226.45
Blue M 4GD	399.40
Navy Blue M RB	341.85
Turquoise M-G	240.30
Brill. Blue M GX	516.25
Blue 3R Acra Powder	718.20
Dark Brown H 6R	248.45
Cobalt Oxide	285.00
Green H4BD	287.00
Green H-E4BI	169.80
Red Brown H IF	143.25
Orange Brown H 2B	259.05
Brown M GRN	182.80
Black H-N	314.20

SULPHUR COLOURS	Per Kg.
Navy Blue	210.35
Green G	194.55
Black Grains Extra	72.25
Black Grains OG	73.70
Black GXE Conc.	70.85
Black GXE	57.90
Black GXR	69.40
Black Grains 800	62.80
Black EXR Grains	73.70
Black EXR Grains 800	59.35

VAT COLOURS (ICI)	Per Kg.
Yellow 5G Supra Disperse	561.85
Yellow 5G Acra Conc	818.60
Gold Orange 3G Pdr. Fine	1158.45
Brill. Orange 6R Pdr. Fine	624.35
Gold Orange 3G Supra Disp	693.85
Brill. Orange 6RX Powder	394.30
Brill. Red 3B Pdr. Fine	1214.15
Brill. Red 3B Supra Disp	[illegible]
Brill. Purple 2R Acra Powder	[illegible]
Brill. Purple 2R Hly Conc	744.25
Brill. Purple 4R Supra Disp.	604.25
Brill. Purple 2R Acra Conc	779.85
Blue 2R Powder Fine	675.30
Blue BC Acra Con Pdr. Fine	1013.15
Blue BC Conc. Pdr. Fine	713.65
Blue R Conc. Pdr. Fine	719.70
Blue Conc. Powder	645.80
Brill. Blue 2R Hly. Conc	378.55
Blue RR Supra Powder	629.35
Brill. Blue 2R Supra Disp	115.65
Dark Blue 2R Powder Fine	512.65
Blue BC Supra Disp	419.65
Jade Green XBN Powder Fine	555.80
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Jade Green 2G Pdr. Fine	533.25
Jade Green 2G Pig. Paste	125.40
Jade Green XBN Pig. Paste	126.00
Jade Green 2G Supra Disp.	618.30
Olive D Pdr. Fine	563.90
Olive Green B Supra Disp	421.70
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Olive OMW Supra Disp	538.35
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Olive Green B Acra Conc	741.10
Olive R Acra Conc	779.85
Brown R Pdr. Fine	889.45
Dark Brown 3R Fine	836.25
Brown G Supra Disc	582.15
Brown 2G Supra Disp	716.10
Brown R Supra Disp	547.35
Brown BR Powder	867.75
Dark Brown 3R Pig. Paste	217.15
Dark Brown 3R Supra Disc	[illegible]
Brown G Acra Conc	947.95
Brown M. Powder Fine	768.80
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Blue BC Acra Conc. Pdr. Fine	762.75
Direct Black AC Supra Disp	415.75
Direct Black AC Pdr. Fine	574.75
Direct Black CH Supra Disp	490.45
Direct ACG Pig. Paste	[illegible]

Madras Market

Market remained unresponsive. Borax prices went up marginally. Demand for dyes and textile auxiliaries was generally good. Consumption from pharmaceutical units declined sharply. There have been heavy imports of methanol, with Kandla port receiving substantial quantities, mostly from Eastern countries. It is reported that the price difference between the imported and indigenous methanol is quite sizeable and this has triggered imports from all consuming sectors.

(MADRAS MARKET RATES AS ON DECEMBER 9, 1989)

Acetic Acid Glacial (per kg)	16.00
Aluminium Sulphate iron free (per MT)	4,000.00
Ammonium Bicarbonate (per 25 kgs)	145.00
Ammonium Chloride (per MT)	3,000.00
Acid Slurry (per kg)	31.00
Barium Carbonate (per kg	8.50
Barium Chloride (per kg)	7.50
Boric Acid Technical (per kg)	26.00
Bleaching Powder (per 50 kgs)	220.00
Borax (per 50 kgs)	745.00
Caustic Soda Flakes – Mettur Chemicals (per MT)	11,500.00
Caustic Soda Flakes – Andhra Sugars (per MT)	11,500.00
Calcium Chloride 70% Solid (per MT)	3,000.00
Calcium Chloride Anhydrous (per MT)	5,750.00
Calcium Carbonate (Activated) (per MT)	[illegible]
Calcium Carbonate (Precipitated) (per MT)	5,000.00
Citric Acid (per kg)	46.00
Copper Sulphate (per kg)	25.00
Cresylic Acid 98-99% (per kg)	130.00
Pure Para Cresol 96% (per kg)	84.00
Meta Para Cresol 42% (per kg)	49.00
Formic Acid (per kg)	26.00
Formaldehyde (per kg)	8.00
Glue Flakes (per kg)	15.00
Glycerine I.W. (per kg)	51.00
Hydrosulphite of Soda (TCPL) (per kg)	38.00
Hydrosulphite of Soda (ICI) (per kg)	42.00
Hydrosulphite of Soda (BASF) (per kg)	42.00
Hexamine (per kg)	30.00
Hyflosupercell (per kg)	21.00
Hydrogen Peroxide (per kg)	31.50
Litharge (per kg)	40.00
Lead Acetate (per kg)	45.00
Magnesium Carbonate (per kg)	[illegible]
Magnesium Chloride (per kg)	
Maleic Anhydride (per kg)	
Menthol Crystals (per kg)	
Oxalic Acid (per kg)	
Paraffin Wax (per kg)	
Potassium Bichromate (per kg	
Phosphoric Acid (per kg)	
Polyvinyl Alcohol Powder (per	
Pentaerythritol (per kg)	
Phthalic Anhydride (per kg)	
Soda Ash (TAC) (per 75 kgs)	
Soda Ash (TATA) (per 75 kgs	
Sodium Bicarbonate (TATA) (per 50 kgs)	
Sodium Silicate (per MT)	
Sodium Bichromate (per kg)	
Sodium Nitrate (per kg)	
Sodium Nitrite (per kg)	
Sodium Sulphide Flakes (per	
Sodium Bisulphite (per kg)	
Sodium Alginate (per kg)	
Sodium Acetate (per kg)	
Sodium Sulphate (Anhydrous	
Titanium Dioxide (Anatase) (	
Titanium Dioxide (Rutile) (pe	
Trisodium Phosphate (per kg	
Urea (Technical) (per kg)	
Zinc Oxide (per kg)	
Zinc Chloride Powder (per k	
Zinc Sulphate (per kg)	
SOLVENTS	
Acetone -- HOCL (per kg)	
Butanol (per kg)	
Butyl Acetate (per kg)	
Benzene (per lit)	
Cellosolve (per kg)	
Carbon Tetra Chloride (per	
Chloroform (per kg)	
Diacetone Alcohol (per kg)	
Diethylene Glycol (per kg)	
Dichloroethane (per kg)	
Di-octyl Phthalate (per kg)	
Di-N-butyl Phthalate (per k	
Ethyl Acetate (per kg)	
Isopropyl Alcohol (per kg)	
Methanol (per kg)	
Methylene Chloride (per kg	
Methyl Ethyl Ketone (per k	
Methyl Isobutyl Ketone (pe	
Phenol (per kg)	
Sorbitol (per kg)	
Triethanolamine (per kg)	
Trichloroethylene (per kg)	
1-1-1 Trichloroethane (per	
Turpentine (per lit)	
Toluene (per lit)	
Xylene (per lit)	

Shipping News

VESSELS DUE IN BOMBAY FOR EXPORT LOADING

	Agents (3)	Will load for (4)	Appro sailing (5)
	Oceanic	Jeddah; P. Said; Rijeka.	30/12
	Merzario/	Jeddah; Hodeidah; P. Sudan; Ravenna; Ancona; Piraeus; Venice; Trieste. (Carting at M.O.D. No. 2).	26/12
	Seaspeed/	Tilbury; London; Felixstowe; Manchester; Liverpool; Avonmouth; Le Havre; Rotterdam; Hamburg; Antwerp; Bremerhaven and Scandinavian ports. (Carting at Hay Bunder No. 3).	
	L. Trieste/	Jeddah; Trieste; Venice; Ravenna; Rijeka; Naples. (Carting M-171/173 C.D.).	
	Oceanic/	P. Said; Limassol; Alexandria; Casablanca; Tripoli; Livorno; Genoa; Mersin; Iskendren; Izmir. (Carting at Wadi Bunder No. 3).	
	Killick	Jeddah; Felixstowe; London; Liverpool; Manchester; Bristol; Avonmouth; Leeds; Glasgow; Tilbury; Birmingham; Dublin; Belfast; Rotterdam; Hamburg; Le Havre; Antwerp; Bremen; Bremerhaven; Fos; Valencia; Marseilles; Barcelona. (Carting at M-178/180 Cotton depot).	
	Kanika	Antwerp; Rotterdam; Hamburg; Le Havre; Genoa; Gothenburg; Stockholm; Copenhagen; Oslo; Helsinki; London; Felixstowe; Tilbury. (Carting at Timber Pond No. 3).	26/12
una)	Marine Trans/	Antwerp; Rotterdam; Hamburg; Bremen; Le Havre; Felixstowe; Hull; Rostock; London; Liverpool; Avonmouth; Copenhagen; Gothenburg; Aarhus; Oslo; Stockholm; Helsinki; Malmo; Norrkoping; Helsingburg; (Including inland destinations for above ports); Latakia; Limmasol; Izmir; Mersin; Istanbul; Beirut; Marseilles; Valencia; P. Said; Casablanca; Alexandria; Piraeus; Soloniki; Iraqi ports. (Carting at T.P. No. 3).	26/12
	Khemka/	Larnaca; Mersin; Izmir; Casablanca; Genoa; Latakia; Alexandria; Istanbul; Las Palmas & Tenerife; Antwerp; Rotterdam; Hamburg; Bremen; Gdansk; Le Havre; Copenhagen; Gothenburg; Aarhus; Oslo; Stockholm; Malmo; Helsinburg; Helsinki; Kotka. (Carting at Wadi Bunder No. 3).	
	M.C.S./	Jeddah; Genoa; Felixstowe; Hamburg; Rotterdam; Antwerp; Le Havre; Gdynia; Lisbon; Aarhus; Copenhagen; Gothenburg; Oslo. (Carting at H.B. No. 4).	
	Ranadip/	Jeddah; Palermo; Naples; Livorno (Leghorn) Marseilles (Fos); Genoa; Barcelona; Bilbao; Valencia; Alicante; Algiers; Lisbon; Leixoes; Bremerhaven; Le Havre; Antwerp; Rotterdam; Bremen; Hamburg; Aarhus; Piraeus; Gothenburg; Oslo; Copenhagen; Stockholm; Helsinki; Felixstowe; Tilbury; London; Avonmouth; Dublin; Belfast; Grangemouth; Liverpool; Manchester. (Carting at M.O.D. No. 1).	
	Arebee	Alexandria; Piraeus; Venice; Trieste; Koper; Naples; Fos; Barcelona; Valencia; Livorno; Las Palmas; Limmasol; Constanza. (Carting at M-Jetha Cotton depot).	
	S.C.I.	Odessa. (Carting at Timber Pond No. 1).	29/12
	Oceanic	P. Said; Rijeka; Med. ports. (FCL only). (Carting at W.B. No. 3).	21/12
une	Volkart Fleming	Leghorn; Marseilles; Naples; Barcelona; Bilbao; Bordeaux; Alicante; Genoa; Valencia; Bremen; Jeddah; Antwerp; Rotterdam; Bremerhaven; Hamburg; U.K. & Scandinavian ports. (Carting at M.O.D. No. 3).	23/12
rian a	Transocean	Odessa; Ilyichevsk; Havana (Cuba); Genoa; Trieste; Piraeus; Marseilles; Barcelona; Varna; Bourgas. (Carting at Kalamboli).	23/12
	M.C.S.	P. Said; P. Suez; Alexandria; Jeddah; Aden & other Red Sea ports.	27/12
[Ind]	S.C.I.	Felixstowe; Hamburg; Rotterdam; Antwerp; Bremen; Liverpool; Le Havre; Manchester; Avonmouth; London; Belfast; Aarhus; Oslo; Copenhagen; Gothenburg; Helsinki and all inland destinations. (Carting at T.P. No. 1).	24/12

(1)	(2)	(3)	(4)
21/12	Maruka	U.L.A.	P. Sudan; Aden; Djibouti; Hodeidah.
14/12	Vermilion Bay	Silvership	Chittagong. (Carting at 19-ID).
19/12	Aram Khachaturian	Transocean	Afghanistan. (Carting at Kalamboli).
15/12	Abu Qir	M.C.S.	Jakarta, Korea & Japan ports.
14/12	Vermilion Bay (V-08) (Pan)	Samrad/	Singapore (direct); Penang; Jakarta; Surabaya; Belawan; P. Kelang; Bangkok; Manila; Hong Kong; Kaohsiung; Keelung; Taichung; Busan Yokahama; Nagoya; Kobe; Osaka; Tokyo. (Carting at Maliett Bunder).
		Trident/	Busan, Hong Kong; Keelung; Kobe; Nagoya; Penang; P. Kelang. Bangkok; Kaohsiung; Singapore. (Carting at T.P. No. 4).
		U.L.A./	Singapore; Penang; P. Kelang; Keelung; Kaohsiung; Bangkok; Busan. Jakarta; Hong Kong; Japan & Chinese ports. (Carting M-171/175 C.D.).
		E.S.P.L.	Singapore; Hong Kong; Bangkok; Jakarta; Kaohsiung; Keelung; Penang. P. Kelang; Kota Kinabulu; Kulaubelati; Bintulu; Kuching; Labuan; Vietnam (P.R.C.) (Carting at Mallet Bunder).
		I.M.E./	Singapore; Bangkok; Hong Kong; Keelung; Busan; Kobe; Yokohama. Nagoya. (Carting at Wadi Bunder No. 3).
		Silvership/	Singapore; Far East & Japan ports. (Carting at 19-ID).
		M.C.S./	Singapore; Hong Kong; Keelung; Kaohsiung; Jakarta; Surabaya; Bangkok; Penang; P. Kelang. (Carting H.B. No. 4 for M.C.S.).
		Kanika	Bangkok; P. Kelang; Jakarta; Keelung; Busan, Hong Kong. (Carting at T.P. No. 3).
15/12	Yemen Pioneer	Marine Trans/	Singapore; Hong Kong; Busan; Kobe; Tokyo; Djakarta. (Carting at T.P. No. 3).
		M.C.S./	Far East & Japan ports. (Carting at H.B. No. 4).
		Ranadip/	Far East & Japan ports. (Carting at M.O.D. No. 3 for Ranadip).
		Khemka	Singapore; Hong Kong; Busan; Tokyo; Kobe. (Carting at W.B. No. 3)
16/12	Prospect	P & O/ I.M.E./ Killick	Singapore. (Carting at W.B. No. 3 for I.M.E.). (Carting at M 178/180 C.D. for Killick). (Carting at T.P. No. 4 for P & O).
19/12	Maersk Clementine (Sing) (V-8936)	Volkart Fleming	Penang; Singapore; Hong Kong; Keelung; Kaohsiung; Busan; Main Japan ports; Manila; Jakarta; Surabaya; Bangkok; P. Kelang; Chinese ports. (Carting at M.O.D. No. 2).
14/12	Vermilion Bay (V-08)	Samrad/	Brisbane; Sydney; Melbourne; Adelaide; Fremantle; Brunie. (Carting at Mallet Bunder).
		Trident/	Brisbane; Sydney; Melbourne; Adelaide, Fremantle; Burnie; Auckland. Wellington; Lyttleton. (Carting at T.P. No. 4).
		Archer/	Sydney; Melbourne; Adelaide; Brisbane. (Carting at M-Jetha cotton depot).
		Trans-world/	Sydney; Melbourne; Adelaide; Fremantle; Burnie; Brisbane; (Carting at CFS cotton avenue).
		Kanika/	Brisbane; Sydney; Melbourne; New Castle. Adelaide; Fremantle; Auckland; Wellington; Lyttleton. (Carting at Timber Pond No. 3)
		Silvership	Sydney; Melbourne; Brisbane; Adelaide; Fremantle; Auckland. Wellington; Lyttelton; P. Chalmers. (Carting at 19-ID).
15/12	Yemen Pioneer	M.C.S.	Sydney; Melbourne; Brisbane; Burnie; New Castle. (Carting H. B No. 4).
16/12	Prospect (Phi) (V-04)	I.M.E./	Sydney; Melbourne; Adelaide; Fremantle; Brisbane; Auckland; Wellington; Lyttelton. (Carting at Wadi Bunder No. 3).
		P & O/ Killick	Melbourne, Sydney; Brisbane; Adelaide; Fremantle; P. Hobart, Devon P Launceston; Burnie; P. Chalmers; Lyttelton; Christchurch; Dunedin. New Plymouth; Auckland; Wellington; Napier also Western Samoa Papua New Guinea, Solomon Island; American Samoa, Tonga, New Caledonia; Rabaul; P. Villa. (Carting at T.P. No. 4 for P & O). (Carting at M-178/180 cotton depot for Killick).
14/12	Seacrest Achiever (V-203)	Parekh/	Muscat; Dubai; Sharjah; Abu Dhabi; Bahrain; Dammam; Kuwait; Baghdad. (Carting at Hay Bunder No. 4).
		Merzario/	Dubai; Sharjah; Abu Dhabi; Muscat; Doha; Dammam; Kuwait; Bahrain (Carting at 14-VD for Merzario).
		L. Triest	Dubai, Dammam; Riyadh; Muscat; Abu Dhabi; Doha, Kuwait; Bahrain (Carting at 171/173 cotton depot for L. Triest).
		[illegible]	[illegible]

	(3)	(4)	(5)
	Ranadip	Dubai; Muscat; Abu Dhabi; Doha; Dammam; Bahrain; Kuwait (Carting at M.O.D. No. 3).	20/12
	Mackintosh	Muscat; Dubai.	23/12
ne	V. Fleming	Dubai; Dammam; Muscat; Bahrain; Kuwait; Riyadh; Doha. (Cart. MOD 2).	23/12
	U.L.A.	Dubai; Dammam; Kuwait; Bahrain; Riyadh; Abu Dhabi; Doha.	26/12
Ind)	S.C.I.	P. Louis. (Carting at T.P. No. 1).	23/12
	Senrat/	Longbeach; Oakland; Seattle; Los Angeles; Sanfrancisco; Philadelphia; Savannah; Charleston; Baltimore; Norfolk; New York; Boston; St. John; Vancouver; Montreal; Toronto; New Orleans; Houston; (Carting M.B.).	20/12
	U.L.A./	Los Angeles; Sanfrancisco; Oakland; Seattle; Vancouver; Charleston; Houston; Norfolk; Baltimore; New York; Halifax; Montreal; Toronto; S. American West Indies ports. (Carting at M-171/173 cotton depot).	
	E.S.P.L./	Longbeach; Charleston; New York; St. John; Norfolk; Oakland; Vancouver; (B.C.); Seattle; Montreal; Baltimore; Boston; Chicago; Dallas; Houston; Longview; Los Angeles; New Orleans; Philadelphia; Portland; San Diego; Mexico city; Sanfrancisco; Snowfall; Sacramento; Stockton; Halifax; Toronto; Savannah; Tacoma; Miami & all other destinations. Also Caribbean ports. (Carting at Mallet Bunder).	
	Trident/	S. American; Caribbean & Central American ports. (Carting at T.P. No. 4).	
	Arebee	S. American ports. (Carting at M-Jetta cotton depot).	23/12
ver	Seaspeed/	New York; Baltimore; Norfolk; Savannah; Charleston; Houston & S. American ports. (Carting at Hay Bunder No. 3).	
	Oceanic/	New York; Baltimore; Philadelphia; Chicago; Boston; Norfolk; Atlanta; Charleston; Savannah; Miami; Houston and other inland destinations in U.S. East coast & S. American ports. (Carting at Wadi Bunder No. 3).	
	Marine Trans	Boston; New York; Baltimore; Norfolk; Charleston; Port Everglades; Jacksonville; Galveston; Houston; Los Angeles; Toronto; Montreal; Philadelphia; Savannah; New Orleans; South & Central American ports. (Carting at T.P. No. 3).	20/12
	M.C.S./	Savannah; New York; Baltimore; Wilmington; Houston; Galveston; Los Angeles; Boston; Norfolk; Charleston; Jacksonville; Miami; Tampa; New Orleans; Providence; San Diego; Oakland; Sanfrancisco; Stockton; Chicago; Detroit; Cleveland; Milwaukee; Columbus; Kansas city; Atlanta; Nashville; Dallas; Minneapolis. (Carting at Hay Bunder No. 4).	
	Ranadip	New York; (Elizabeth); Portsmouth (Norfolk); Baltimore; Charleston; Boston; Philadelphia; Houston; New Orleans; Jacksonville; Savannah; Wilmington (N.C.); Mobile; P. Everglades; (Miami); Los Angeles (Long Beach); Oakland; Portland; Seattle; Anchorage; Montreal; Quebec; Ontario; Toronto via Halifax. Vancouver; Detroit also Caribbean & Mexican ports. (Carting at M.O.D. No. 3). S. American ports. (Carting at M-178/180 Cotton depot)	21/12
Nor)	Killick Patvolk	New York; Boston; Norfolk; Montreal & Toronto via Halifax; Wilmington; Philadelphia; Baltimore; Charleston; Houston; Savannah; New Orleans & FCL Chicago; Milwaukee; Atlanta; Dallas. (Carting at H.B. No. 5).	24/12
	Oceanic	New York; Baltimore; Philadelphia; Chicago; Boston; Norfolk; Atlanta; Charleston; Savannah; Miami; Houston and other inland destinations in U.S.E. coast & S. American ports. (Carting at Wadi Bunder No. 3)	21/12
ntine 936)	Volkart Fleming	New York; Philadelphia; Baltimore; Norfolk; Charleston; Savannah; Jacksonville; Miami; New Orleans; Houston; Toronto; Montreal; Chicago; Atlanta; Denver; Dallas; Wilmington; Milwaukee; Detroit; Minneapolis; Memphis; Nashville; Cleveland; Phoenix; Boston; Los Angeles; Vancouver; Seattle; Sanfrancisco; Portland; Longbeach. (Carting at M.O.D. No. 2).	23/12
		[illegible] & S. American ports [illegible] & other inland destinations	26/12

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rn Korea: Sudar-
ls., 2,000 Kgs.,

From Japan: High-
, 1,000 Kgs.,
ern Inds., 5,000
K.K. Research
s. 3,81,468; RSA
Rs. 3,81,468; Vipul
ITs., Rs. 2,44,312.

D: From Japan:
Kgs., Rs. 4,83,124.

KIDE: From Japan:
Ltd., 14,000 Kgs.,

ACID ANILIDE:
cals & Allied Pro-
85,593.

DLAMINE: From
ndia Ltd., 15,600

om China: Vipul
Pvt. Ltd., 2 MTs.,

ID: From Nether-
, 22.68 MTs.,

TATE: From USA:
BHEL, 14,768.4 Kgs., Rs. 10,82,580.

PARA TERTIARY BUTYL PHENOL: From Japan: Indian Plastic Ltd., 4,000 Kgs., Rs. 91,553.

CAPROLACTAM: From Spain: Modipon Fibres Co., 2,500 Kgs., Rs. 70,18,062.

CARBON BLACK: From USA: Modi Xerox Ltd., 2,300 Lbs., Rs. 1,25,125.

COUMARIN: From France: Hindustan Lever Ltd., 1,000 Kgs., Rs. 2,62,789.

DANE SALT: From Singapore: Ranbaxy Labs. Ltd., 3,000 Kgs., Rs. 14,68,111.

EPICHLOROHYDRIN: From Japan: Grauer & Weil India Ltd., 10.08 MTs., Rs. 2,03,482.

ETHYL MERCAPTAN: From Belgium: Bharat Petroleum Corpn. Ltd., 4,320 Kgs., Rs. 1,31,056; From Netherlands: Cyanamid India Ltd., 39,950 Kgs., Rs. 8,97,070.

GAMMA PICOLINE: From Japan: Pfizer Ltd., 10,070 Kgs., Rs. 5,12,184.

HEXYLENE GLYCOL: From UK: K.K. Research Centre, 1,900 Kgs., Rs. 43,600.

HYDRAZINE HYDRATE 80%: From France: Gujarat State Exports Corpn., 32,000 Kgs., Rs. 9,45,972.

IODINE CRUDE: From Channel Islands: Sunil Chemicals, 1 MT., Rs. 2,84,512.

IRON OXIDE: From USA: Western Components Ltd., 1,000 Kgs., Rs. 54,258.

ISOPROPYL ALCOHOL: From Taiwan: Coates of India Ltd., 12.8 MTs., Rs. 1,54,079; S.D. Fine Chem P. Ltd., 12.8 MTs., Rs. 1,54,079.

LINALYL ACETATE: From France: Seth Bros. P. Ltd., 600 Kgs., Rs. 96,152; From FRG: Hindustan Lever Ltd., 5,040 Kgs., Rs. 8,11,372.

LITHOPONE: From China: Anglo Dutch Paint Colour & Varnishes, 18,000 Kgs., Rs. 1,22,678.

LUTIDINE: From Japan: Lawande Pharmaceutical Ltd., 555 Kgs., Rs. 1,27,459.

METHYL ISOBUTYL KETONE: From Taiwan: Bayer India Ltd., 39,600 Kgs., Rs. 7,94,953.

MOLYBDENUM TRIOXIDE: From Japan: Sudarshan Chemical Inds., 1,000 Kgs., Rs. 1,27,326.

MURIATE OF POTASH: From Jordan: Indian Potash Ltd., 1,545 Kgs., Rs. 35,40,380.

OCTOIC ACID: From FRG: Modern Chemical Plastics, 14.43 MTs., Rs. 2,43,855.

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c Acid — Powder/Granular
per Sulphate — ISI & COC: WDP 50%
MANUFACTURERS
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Madras 600 001

PRILLS: From Spain: Henkel Chemicals Pvt. Ltd., 18 MTs., Rs. 1,49,536.

D-ALPHA PHENYL GLYCINE CHLORIDE HCl: From Italy: Lupin Labs Ltd., 5,530 Kgs., Rs. 19,97,235.

POLYVINYL CHLORIDE: From Mexico: Omni Plast Bby P. Ltd., 100 MTs., Rs. 12,68,368; Orient International, 50.7 MTs., Rs. 8,93,958; Plastotex Pvt. Ltd., 50 MTs., Rs. 6,34,180; Plasmers (Bombay) Pvt. Ltd., 50 MTs., Rs. 6,34,180.

PROPYLENE GLYCOL: From Singapore: GTC Inds. Ltd., 4,300 Kgs., Rs. 98,419.

PROPYLENE GLYCOL USP: From USA: M.J. Exports Ltd., 25,155 Kgs., Rs. 5,50,[illegible].

PYRIDINE: From Japan: Atic Inds. Ltd., 5,130 Kgs., Rs. 3,40,941.

STYRENE MONOMER: From USA: Henkel Chemicals India Ltd., 35,200 Kgs., Rs. 5,66,946.

SULPHONIC ACID: From France: Lubrizol India Ltd., 1,716 Kgs., Rs. 4,44,314.

TARTARIC ACID BP/USP: From Argentina: Lupin Labs Ltd., 3,800 Kgs., Rs. 18,91,875.

TETRAHYDROFURAN: From FRG: Mafatlal Inds. Ltd., 4,500 Kgs., Rs. 2,40,148.

TITANIUM DIOXIDE ANATASE: From China: Sharda Processors Pvt. Ltd., 9.12 MTs., Rs. 2,62,857.

TITANIUM DIOXIDE: From USA: Coates of India Ltd., 1,500 Kgs., Rs. 6,48,496.

TRIETHYLENE GLYCOL: From Japan: Essar India Ltd., 8,100 Kgs., Rs. 2,47,191.

TRIMETHYL CHLOROSILANE: From FRG: Lyka Labs Ltd., 2,040 Kgs., Rs. 1,57,368.

TRIMETHOXY BENZOIC ACID: From UK: Pragati Chemicals, 6,500 Kgs., Rs. 7,86,572.

2,4-XYLIDINE: From Switzerland: Unity Dye Chem, 600 Kgs., Rs. 45,153.

DRUG MATERIALS IMPORTED BOMBAY

(From 27.10.89 to 31.10.89)

D-CALCIUM PANTOTHENATE USP/BP: From Japan: Cyanamid India Ltd., 1,000 Kgs., Rs. 2,25,466.

MORPHOLINE: From UK: Bayer India Ltd., 1,638 Kgs., Rs. 6,24,845.

PSEUDO EPHEDRINE HCl BP/USP: From China: Biological E. Ltd., 1,000 Kgs., Rs. 1,28,851.

SODIUM LAURYL SULPHATE: From FRG: Mehta Dye Chem, 10,000 Kgs., Rs. 3,57,105.

SULPHATHIAZ
China: G. Amptrav
Rs. 4,87,914.

PLASTIC M
IMPOR
BOMI
(From 27.10.8

HDPE: From Ca
Impex Pvt. Ltd.,
Rs. 28,23,250; Fror
Ltd., 50 MTs., R
Saudi Arabia: Harka
57.45 MTs., Rs. 6,6
tics, 17.15 MTs.,
Supreme Inds. L
Rs. 12,05,761; From
jan Plastics, 17 M
From USA: Viswa
13.638 MTs., Rs. 1

LDPE: From Qat
ings Ltd., 33 MTs.,
Saudi Arabia: Raj
Ltd., 148.5 MTs., R
Yugoslavia: Hindus
MTs., Rs. 6,04,464

LLDPE: From
Supreme Inds.
Rs. 1,99,635; From
Plastics Ltd., 99 M
Shah Monofilamen
MTs., Rs. 1,76,238
prises, 16.5 MTs.,

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(From 1.11.89 to 10.11.89)

ACETYL CHLORIDE: From FRG: Cheminor Drugs Ltd., 65,880 Kgs., Rs. 20,37,151.

N-ACETYL SULPHANILYL CHLORIDE: From Japan: SOL Pharmaceuticals Ltd., 30.5 MTs., Rs. 14,97,957.

ALLYL CHLORIDE: From Japan: Ronuk Industries Limited, 14,400 Kgs., Rs. 4,11,679.

ALUMINA ACTIVATED: From USA: Wilko (India) Ltd., 1,088 Kgs., Rs. 90,277.

AMMONIUM PERSULPHATE: From FRG: Sarvodaya Chemical Works, 2,000 Kgs., Rs. 44,754.

AROMATIC CHEMICALS: From FRG: Ambica Chemical Products, 400 Kgs., Rs. 26,853; B.V. Aswathiah & Bros. 250 Kgs., Rs. 64,635; From Switzerland: Shalimar Agarbati Co., 150 Kgs., Rs. 26,904; From UK: Nanco Overseas, 500 Kgs., Rs. 1,29,727.

BARIUM SULPHATE: From Singapore: Jenson Paints, 6,000 Kgs., Rs. 26,928.

TETRA BROMO BISPHENOL: From Netherlands: SIP Resins Ltd., 6 MTs., Rs. 2,63,383.

TERT. BUTANOL: From FRG: Peroxides India Ltd., 24,980 Kgs., Rs. 5,31,302.

PARA TERT. BUTYL CYCLOHEXANONE: From FRG: Bush Boake Allen India Ltd., 200 Kgs., Rs. 15,368.

CARBON BLACK: From Korea: MRF, 105 MTs., Rs. 11,68,051.

CHLORO PROPIONIC ACID: From Japan: Vorin Labs Pvt. Ltd. 15,840 Kgs., Rs. 3,20,657.

DIETHYLENE GLYCOL: From China: Seemann Leather Fabrics, 36 MTs., Rs. 4,45,070.

EPICHLOROHYDRIN: From Japan: Kamkamal Labs., 2,400 Kgs., Rs. 69,098.

ETHYL ETHOXY METHYLENE MALONATE: From France: Themis Drugs & Chemicals Ltd., 3,060 Kgs., Rs. 8,43,119.

ETHYL SUCCINYL CHLORIDE: From France: Pradeep Drug Co., 500 Kgs., Rs. 2,00,968.

ETHYLENE GLYCOL MONO BUTYL ETHER: From USA: Chemcrown India Ltd., 13,526 Kgs., Rs. 3,03,744.

ETHOXY METHYLENE DIETHYL MALONATE: From FRG: Dr. Reddy's Labs Limited, 8 MTs., Rs. 17,61,308.

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EUGENOL: From Singapore: Dinamit Enterprises, 220 Kgs., Rs. 11,304.

HELIOTROPIN: From Japan: N. Ranga Rao & Sons, 500 Kgs., Rs. 1,81,805.

HEXAMETHYLENE DIAMINE ADIPATE: From France: Shriram Fibres Ltd., 35 MTs., Rs. 10,57,264.

HYDROXYLAMINE SULPHATE: From FRG: SRL Organics Ltd., 36,000 Kgs., Rs. 9,91,518; From USA: Siris Ltd., 16,000 Kgs., Rs. 4,23,998.

D(-)P. HYDROXY PHENYL GLYCINE: From Netherlands: Asipi Chemicals, 500 Kgs., Rs. 1,69,130.

PARA HYDROXY PHENYL GLYCINE: From Singapore: TTK Chemicals Ltd., 1,000 Kgs., Rs. 3,72,584.

ISOBUTYL BENZENE: From USA: Priya Chemicals, 13,657 Kgs., Rs. 7,74,821.

ISOPROPYL ALCOHOL: From Argentina: Medobl Chemicals & Pharmaceuticals, 13,000 Kgs., Rs. 1,62,135; From Singapore: Cwell Drugs Pvt. Ltd., 13 MTs., Rs. 1,54,040.

L-LYSINE MONO HCl: From Korea: Sunnex Commercial Pvt. Ltd., 1,000 Kgs., Rs. 66,049.

LAB CHEMICALS: From FRG: Astra Research Centre, 6 Nos., Rs. 5,075; From Sweden: Astra Research Centre, 9 Nos., Rs. 31,175; From USA: Astra Research Centre India, 120 Nos., Rs. 86,432; Vision Research Foundations, 6 Nos., Rs. 2,201.

MALONIC ACID: From Japan: Reckitt & Colman of India Ltd., 25 Kgs., Rs. 1,414.

MERCAPTO BENZIMIDAZOLE: From Japan: Shriram Fibres Ltd., 400 Kgs., Rs. 74,336.

2-MERCAPTO BENZIMIDAZOLE: From Japan: Shriram Fibres Ltd., 2.5 MTs., Rs. 4,67,575.

DL-METHIONINE: From Sunnex Commercial Pvt. Ltd Kgs., Rs. 1,37,179.

METHYL ACETO ACE From Japan: Shahsun Chemica Ltd., 16 MTs., Rs. 3,06,504

METHYL CYCLOHEXYL TATE: From UK: Asian Peroxa 8,400 Kgs., Rs. 5,49,020.

METHYL ETHYL KETON France: Luxor Pen Co., 13,60 Rs. 1,53,166; From Japan Chemical Inds., 13,200 Rs. 1,47,543; From Neth Madras Refineries Ltd., 59,9 Rs. 9,22,472; From Singapore 64.35 MTs., Rs. 10,45,360.

METHYLENE CHLORID Netherlands: SOL Pharmaceut 39,780 Kgs., Rs. 3,90,250.

NEOMYCIN SULPHATE USA: Tetragon Chemie Pvt. Kgs., Rs. 2,16,607.

POLYVINYL CHLORID USA: SPIC Electronics & Syst 22 Nos., Rs. 7,09,005.

PROPYLENE GLYCO Japan: Naphtha Resins & C Pvt. Ltd., 16,000 Kgs., Rs. 3

PYRIDINE PURE Fro Themis Agencies, 3,90 Rs. 2,59,348.

RESEARCH CHEMICA UK: Vikram Sarabhai Space Nos., Rs. 18,080.

ROCK PHOSPHATE: Fro EID Parry India Ltd., Rs. 17,64,633.

SODIUM CYANIDE: F Cheminor Drugs Ltd., 9 Rs. 29,86,800.

SODIUM LAURYL S From FRG: Pradeep Drug Kgs., Rs. 37,759.

SODIUM METAL: From Pharmaceuticals Ltd., Rs. 1,35,3

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rlands: Standard
5,030 Kgs.,

SPHATE: Indag
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Polytex Pvt. Ltd.,
364; From Japan:
Pvt. Ltd., 16,500

Kgs., Rs. 2,14,049; Jain Plastics, 30 MTs., Rs. 3,82,074; Sakthi Velu Polypack, 30,000 Kgs., Rs. 3,90,549; From Singapore: Aiswarya Associates, 16 MTs., Rs. 2,03,228; From Singapore: Impex Enterprises, 17 MTs., Rs. 2,12,835; Jampex Enterprises, 51.225 MTs., Rs. 6,44,603; Lalith Polysacks Pvt. Ltd., 76.5 MTs., Rs. 9,71,685; Nidhi Plastics Ltd., 153 MTs., Rs. 19,50,300; RN Polysacks Pvt. Ltd., 15 MTs., Rs. 1,85,774; Rabbani Exports, 17 MTs., Rs. 2,10,516; Ramani Impex, 34 MTs., Rs. 4,21,030; S.S. Laminates Pvt. Ltd., 17 MTs., Rs. 2,22,835; Samex Trading House, 16.5 MTs., Rs. 2,06,784; Sunshine International, 8,500 Kgs., Rs. 97,168; From Saudi Arabia: Rabbani Exports, 25 MTs., Rs. 1,86,685; From UAE: B.M. Shah Corpn., 17,150 Kgs., Rs. 2,14,930; From USA: Perfect Plastic Products Pvt. Ltd., 35,000 Kgs., Rs. 5,24,690; Pushpa Impex Pvt. Ltd., 17,500 Kgs., Rs. 2,01,535.

LDPE: From Singapore: Samex Trading House Inc., 33 MTs., Rs. 4,44,560; From USA: Victory Laminations, 17,000 Kgs., Rs. 2,16,700.

POLYPROPYLENE: From Brazil: Natraj Exports Corpn., 24 MTs., Rs. 3,08,778; From France: MM Rubber Co. Ltd., 82,500 Kgs., Rs. 16,94,775; From FRG: Jain Plastics, 63.5 MTs., Rs. 7,95,551: From GDR: Jain Plastics, 15 MTs., Rs. 1,95,607; From Japan: Trichy Polymers Pvt. Ltd., 23.5 MTs., Rs. 3,16,837; From Singapore: Pandiyan Polymer Pvt. Ltd., 15 MTs., Rs. 1,91,288; From USA: S & S Filled Fibres Ltd., 16,650 Kgs., Rs. 2,39,682; From USA: Wonder Plastics, 17 MTs., Rs. 2,63,434.

POLYPROPYLENE GRANULES: From Singapore: Natraj Export Corpn., 8 MTs., Rs. 1,02,969.

POLYSTYRENE: From Korea: Indoblow Moulds Pvt. Ltd., 17,000 Kgs., Rs. 2,59,115.

STYRENE MONOMER: From FRG: Chemdye Mfg. Co. Pvt. Ltd., 34,400 Kgs., Rs. 5,35,975.

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(From 1.11.89 to 10.11.89)

BASIC YELLOW 40: From UK: H.I. Rafeeque Ameen & Co., 200 Kgs., Rs. 21,787.

DISPERSE DYES: From China: Venkat Leather, 1,000 Kgs., Rs. 70,282.

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ERYTHROMYCIN THIOCYANATE: From USA: Pradeep Drug Co., 1,499.97 Kgs., Rs. 19,61,660.

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